WOMEN AND MICROTECHNOLOGY

CANADIAN ADVISORY COUNCIL ON THE STATUS OF WOMEN

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Introduction

The silicon chip is a tiny flake, about the size of your small fingernail. It is dark in colour and not very substantial-looking at all; a slight gust would scatter a pile of chips to the four winds. Yet these tiny chips, already common in many of the objects we use everyday, are the cause of the microtechnology revolution.

The development of the silicon chip has been a major step in the evolution of science and technology. Its capacity to process data quickly and in huge amounts has such profound consequences that recent progress amounts almost to a revolution.

A silicon chip, which is a piece of almost pure silicon (the basic ingredient of sand), can contain hundreds of thousands of miniature electronic circuit components. Thirty years ago, an electronic circuit with similar capacity would have consisted of a vast array of wires, vacuum tubes, and other paraphernalia. Although there have been other important developments in technology, this single advance — the ability to pack a huge number of electronic circuits into a tiny space — has resulted in the amazing changes we see around us. Wrist-watches, pocket calculators, television sets, toys, microwave ovens, radios, and telephones are only some of the everyday articles we use which employ the chip to replace the cumbersome, bulky electronic circuitry of the past. As a result, these and other products have become cheaper, more compact, and more accurate than their predecessors.

However, perhaps the most amazing application of the silicon chip has been in computers. Twenty years ago, these machines were owned and used only by large organizations who could afford a computer's immense cost, its sometimes quirky operations, and the large and specialized space required to house it. Almost overnight it seems, they have become small, cheap, and immensely more reliable. Today, in most communities, it would be difficult to get through a day without seeing at least one computer in operation: at the bank, in an office, at the grocery store, in a school, or in a neighbour's recreation room.

While the whole area of microtechnology is a fascinating one, it is the developments in computer technology which, for many of us, are the main focus of attention. It is computers which seem to be responsible for the most radical changes, both actual and anticipated, in North American society. The computer is **THE** new tool which preoccupies: most of us watch its appearance with mingled hope and anxiety.

This book, accordingly, focuses on computers from the perspective of women's experience and the consequences for women in particular of the use of these rapidly evolving machines.

Why from women's perspective? Because the very nature of the computer as a data processor with unparalleled power impacts very strongly on women in three major aspects of their lives. The first is in their paid work, in that women are the majority of workers in information processing (as bank tellers, clerks and secretaries of all kinds, phone operators, etc.). The second aspect is in their role as mothers, who often have the major responsibility for the education of their children: at an informal level by example and encouragement, and at the non-formal level as they try (or may not try) to shape the direction taken by their children's teachers, schools, and other levels of the providers of formal education. Finally, women themselves as individuals and as a group need to keep up with the rapid changes in their society, and there is a strong tendency in our society to exclude women from full participation in all aspects of knowledge and power. Women want this to end. They know they must be well-informed and active in our society. Myths about women's lack of mathematical and mechanical skills, or the fact of women's concentration in low-skill, limited-future jobs, must not continue to restrain women's potential.

The Canadian Advisory Council on the Status of Women has prepared this book in order to contribute to increasing women's knowledge about microtechnology, with a particular emphasis on computers.

It is designed for the interested person who has not yet had a chance to familiarize herself with the basic technical aspects of computers and who would like to become acquainted with the social and economic implications for women of this new technology.

A Love/Hate Relationship

It would be difficult to think of a human tool more controversial than the computer. The machine's proponents hail it as the ultimate invention, capable of performing tasks to make our lives easier, fuller, and richer than we dreamed possible. Its detractors warn that the computer will rob us of our jobs, invade our privacy, and dehumanize our society. For every enthusiastic news report about the latest, wonderful advance made possible by the computer, there is another article detailing some just-discovered negative consequence of the new technology.

The computer is, of course, just a machine made of metal, wire, silicon, and plastic. In and of itself, it might not merit a great deal more of our attention than, say, a vacuum cleaner or a chain-saw. The computer, the vacuum cleaner, the chain-saw, and the multitude of other machines invented by humans usually are not, in and of themselves, the objects of our delight or anxiety. It is the uses to which machines are put and the interpretations we make about these uses that create controversy. It isn't the vacuum cleaner that annoys us — it's the assumption that it is always a woman's tool to be used for "women's work". The chain-saw doesn't arouse any particular opinion until it is used to destroy a grove of trees to make way for a parking lot. And so it is, or should be with the computer: the machine itself is not the cause of our problems and concerns; it is the human decisions about the computer's use which demand scrutiny.

Especially for Women

Although the impact of computer technology should be of concern to everyone, there is good evidence to indicate women need to take special initiatives to ensure that the human decisions being made about computers reflect the needs or interests of all humans, including the 51 per cent who are women.

To begin with, we have ample experience to tell us that if we don't involve ourselves with the new technology, it, like other human innovations, will likely end up presenting women with the same old problems we have faced in other fields. Instead of being equal participants in the decisions about the computer and its uses, we will, if we ignore it, find ourselves playing "catch-up" once again. The disadvantages of entering any field late when standards or procedures which do not include women

have already been established are clear. The high technology field, although already dominated by men in some areas such as design and engineering, is still new enough that women may be able to enter other areas on a relatively equal footing, if we inform ourselves thoroughly about the character and potential of computers and then act decisively to ensure that they are a positive force in our lives.

In the Workplace

While women are not significantly disadvantaged with respect to the computer itself, there are early warning signals that the uses to which the machine may be put may repeat some of the familiar patterns which do disadvantage women. Some of the hardest-won gains women have made in recent years have been in the workplace, and it is in the workplace that computers may have the most immediate impact on women. While the machines have the potential to do many of the boring, repetitive jobs that have been women's lot, the cost may be that of the jobs themselves. None of us would quibble at seeing women freed from dull repetitive work; we want to ensure, however, that women find themselves doing new and interesting work rather than frozen out of the paid work world because most of their jobs have disappeared.

In the Home

The negative stereotypes about women's roles which we have worked so hard to overturn have, if we allow it, an opportunity to flourish in a whole new sphere: the personal/home computer. Consider the eager computer salesman whose sales pitch to us consists of pointing out that we can use our computers to keep track of recipes, shopping lists, and Christmas card inventories. He can't think of anything else women might want to use computers for, and neither can the software manufacturers who produce the pre-packaged programs for home computers. Consider your daughter, who sits watching the boys play yet another "shoot-em-up" game, and wonders why she doesn't find the machine as interesting and exciting as she has heard it's supposed to be. If the manufacturers do get around to designing a game for her, it may well be a high tech version of Barbie and Ken on the beach.

The computer itself does not know or care what tasks it is asked to perform or what games it is playing. Yet, to date, the personal

computer performs functions directed mainly at men and boys; applications for women and girls have been given little thought. The manufacturers won't know or care what kinds of programs are needed or wanted by women or girls unless attention is paid to the preferences of this neglected segment of the market. Of course, there is also a large question as to what girls or women **would themselves want** or need from computer technology. If this were studied and clarified, perhaps women could push for computers and programs that would expand their world — and producers might respond positively.

In the Schools

Although there is often talk of great change in the roles and work of family members, women are still very much the primary care givers and educators of our society's children. The education system stands poised on the brink of a revolution brought about by the new technology, and it is women (both teachers and parents) who will have to deal most directly with the effects on children's education. The computer has the potential to make education more personal and individualized, but there are serious questions to be answered about how it can best be introduced to and used in schools.

There is special reason to pay attention to the needs of girls and young women in learning about and with computers. This is because the beliefs still exist that girls are not mathematical and only mathematical people can use computers. If these myths are allowed to persist, we may see yet another generation of disadvantaged girls become disadvantaged women.

With Respect to Our Health

There are many aspects to the concern about the relationship between health and the new technology, but they fall into two large, general areas:

- the effects on eyesight, fertility, and pregnancy of working with the new machines;
- the more generalized and long-term health effects, including increased stress and as yet undefined hazards.

While much remains unknown about the effects on women's health in these areas, research indicates that there is reason for concern and a need for women's input.

In the World

Most of the discussion about computers is about whether we want them in our homes, schools, workplaces, hospitals, businesses, and so on. What we don't hear much about are the new military applications for which computers are being used. The machine is revolutionizing warfare, although just how it is being used, or will be used, is sometimes unclear or secret. Women who have been active in trying to work towards a peaceful world cannot ignore the applications of the technology for instruments of war. Only informed discussion and criticism of this type of computer application will be taken seriously.

And for the Fun of it

Although the new technology creates many dilemmas and problems for women and girls, the terrain is not all bleak. Quite frankly, the computer can be wonderful fun. Colour graphics open up exciting and creative artistic possibilities even for those who "can't draw a straight line", while electronically produced sound makes the computer a new musical instrument with almost unlimited potential. The so-called "business applications" have much wider potential than their name implies. Women who write or want to write will find word processing a gift; those who engage in any type of budgeting, planning or forecasting will see the new electronic spreadsheets (consult glossary for definitions of terms) as very useful tools. Some women will find creating their own programs an activity which taps their ability to be logical and systematic in exciting new ways. There is another aspect of the computer that presently raises many questions about the types of uses to which computers can be used for recreation: computer games in the video arcade.

In the Video Arcades

The "shoot-em-up" games, which form a large proportion of the recreational applications of the computer, find their home away from our homes in arcades which seem already to have become the new preserve of young men. Although girls and women are not restricted from the arcades, in practice, the turf is pretty much staked out by the boys. Although we may be concerned that girls and young women are once again being left out, in this case, it may not be entirely a bad thing; many of the games being played are violent and sexist. That boys and men find these activities acceptable is a matter of ongoing con-

cern. That violence and sexism have a new medium for growth requires careful examination of what really goes on in these recreational settings and consideration of whether changes should be encouraged.

The Machine's Mystique

For many of us, the computer is mysterious and intimidating. The machine's reputation precedes it. We hear the computer is logical, precise, and unfailingly correct, and wonder if we will measure up. We hear it is "intelligent" and wonder whether it will find us lacking. We hear you have to be good at math to use one.

When we do take courage in hand to try to find out about THE MACHINE, we run into the jargon that permeates the computer industry. We ask a simple question about how the computer works and we are confronted with terminology that bears no relation to our mother tongue: "Oh, there's nothing to it — just put the software into the disk drive, hit return, and the program goes right into the 64K RAM. Anything else you want to know?"

While some of the computer's applications sound interesting, many of them, outlined earlier in this chapter, seem likely to diminish the footholds of control over their everyday world that women have established in recent years.

Given the buildup about the complexity of computers and the supposed mathematical requirements for its use, it is understandable that the computer is, for many of us, another source of anxiety and confusion. But as with so many other inventions, women are capable of breaking through the mystique. The machine and its programs, after all, are created by people. If the technology is intimidating, we must demand that good, helpful learning opportunities are available to us. Once we understand the process, we will be equipped to produce programs and applications ourselves, rather than relying on the people who until now have been deciding for us where and to what ends the machines will be used. Computers are tools, and we can be part of deciding what to make of them.

How To Use This Book

This book has been designed with women in mind, although men can also learn from it. The Canadian Advisory Council on

the Status of Women is aware that microtechnology in general and computers in particular are playing a major role in our society already and yet women are not playing a full role in this massive, nearly revolutionary phenomenon. Women come into contact with computers every day and in fact, they make up the huge proportion of the people actively using them, but their involvement in the design, manufacture, and marketing of them is very limited. In addition, women don't have much say either in the types of uses to which the computers will be put, nor about the overall organization of work as it involves computer use.

If this new technology is not to wash right over women, tumbling them along in its wake, shaped by powers larger than they, then women must know more about computers and know more about how to act in relation to them and to those who do organize the production and use of computers.

In the following chapters several related aspects of computers are examined in an attempt to familiarize women with how computers work, their significance to our everyday life and that of our families (in particular, our children), and some ways that women as individuals and in groups can have an effect on the role that these machines are having and may have in our lives.

The first chapter has given a short history of the phenomenal developments in the microtechnology industry, and a brief preview of some of the issues of specific concern to women to be explored later in this book.

Chapter two explains how computers work and defines some terminology. For readers who have little or no experience with computers, this second section should provide a good general understanding of the computer and its associated jargon.

Chapter three looks in more detail at the major areas of concern about the impact of computers on women's lives. What will be the role of computers in offices, factories, homes, and schools? What effects can we expect to see on health, recreation, privacy, the family, education, our paid work, and the peaceful future of the world? How can/should women involve themselves in the issues microtechnology raises?

The final chapter presents action strategies for individual women and women in groups who want to learn more about computers

and microtechnology in general, and who want to involve themselves actively in the uses to which the new technology is put.

A glossary of frequently used computer terminology and a list of useful resources appear at the end of the book, for women who want to continue their explorations.

How the Computer Works[1]

Understanding how the computer works necessitates understanding computer terminology or jargon. It is particularly important for women to gain a working grasp of the vocabulary in order to have full participation in the new technology; speaking the language and contributing to its evolution will help women to have a voice in the decisions about the computer's role and usage.

Two frequently used terms are **HARDWARE** and **SOFTWARE**.

If you can plug it in, it's **HARDWARE**. All the physical components of the computer system are called hardware. The term includes a wide variety of devices (for example: the computer, the keyboard, the printer, the video display terminal) which will be described in more detail in this chapter.

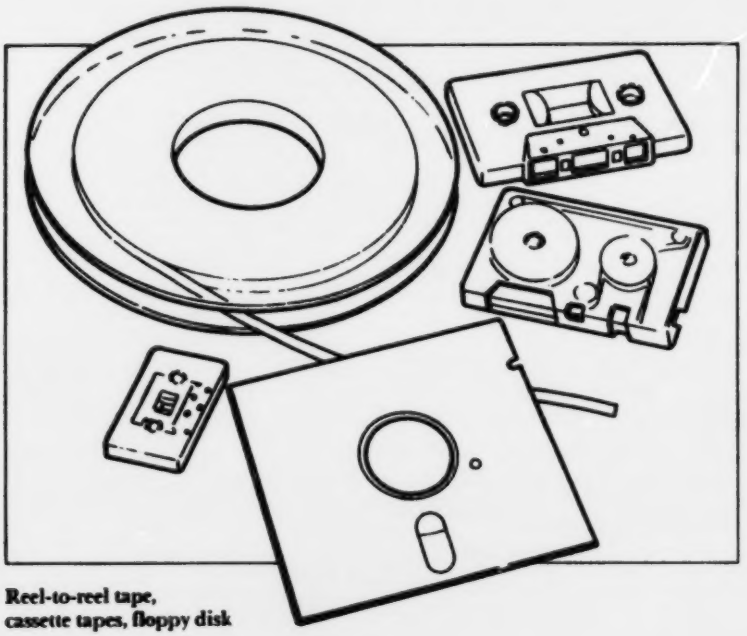
SOFTWARE refers to the programs that tell the computer, step by step, what to do. If, for example, you want the computer to play a game you would use a disk or cassette tape containing the instructions for the game of your choice. If, on the other hand, you wanted to make the computer into a word processing machine, you would select a software package designed for that purpose.

Ready-made software (sometimes called "software packages") can be purchased; the cost of such packages varies with their complexity and their popularity. Such programs are recorded for permanent use on cassette or reel-to-reel tape, "disks", or "floppy diskettes".

Magnetic **TAPE** (in cassettes, cartridges or reels) is well-suited to storing information; its drawback is that you have to rewind the tape to the specific location for a particular piece of information and this takes time and effort.

Hard metal **DISKS**, coated with a magnetic substance, can store information in such a way as to allow the user to locate quickly and use specific segments contained in a large body of data.

The most widely used storage medium for personal computers is the **FLOPPY DISKETTE** (or "floppy"). Ranging in size from three to eight inches in diameter, floppies are made up of a circular piece of flexible plastic that magnetically records and provides access to information. Such diskettes are encased in cardboard jackets to protect them.



Reel-to-reel tape, cassette tapes, floppy disk

Manufactured software packages usually do not require the user to have an understanding of computer languages or programming in order to make full use of them, although you do need to learn the common terminology for each programming package you buy. These are provided in the instructions. On the other hand, the user also has the option of creating her own original programs or software which can also be recorded for permanent use.

An easy way to remember the terms hardware and software is to think of a stereo as hardware (yes, it has a plug) and the record as software (music saved on grooves of the record). A stereo is simply metal and wires with a plug attached to it; it does nothing unless you put on a record. If you put on a recording of your favourite singer, the stereo produces the singing of that artist; you have defined what kind of music-producing machine you want the stereo to become. In a similar way, the computer can be defined by the software which is used with it.

The computer goes beyond the stereo, however, in that it does more than merely reproduce the information which has been placed in it. It can do more than play back what has been previously recorded; the user can handle and work with the information in order to create a new result.

Two terms used in connection with getting information into and out of computers are **INPUT** and **OUTPUT**.

INPUT refers to any information which is entered into a computer to be worked with or stored. This includes instructions, data, or commands.

A computer's **OUTPUT** is the information which results from its processing of the input that it has been given.

I/O is the abbreviation of **INPUT/OUTPUT**.

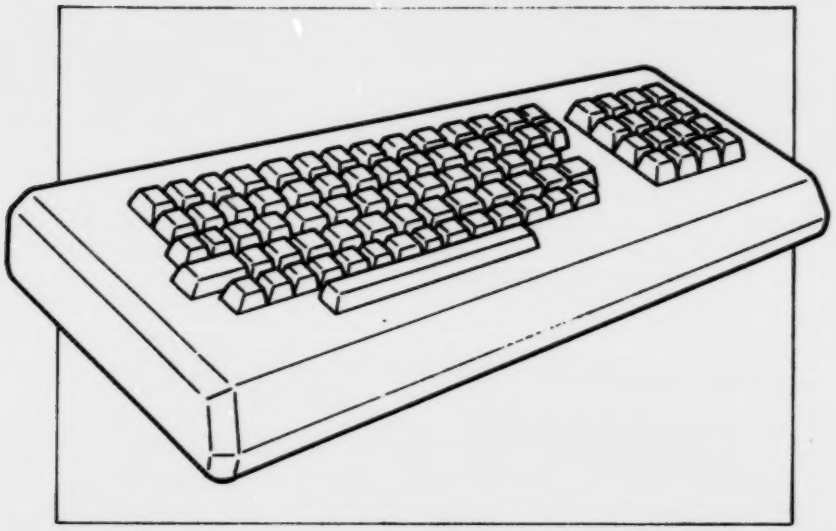
INPUT and **OUTPUT** are words which can be used as both nouns and verbs; for example, "input" can refer to the information which is put into the computer, as well as to the action of putting that same information into the computer.

In order to have the computer act as a useful machine for us, devices which allow information to be put in and taken out are necessary (just as your stereo needs a tone-arm and speakers to be useful).

Input/Output Devices

There are a number of hardware devices that are used to input and output information to and from the computer. The most common pieces of equipment used for input with personal computers are:

- the keyboard (similar in layout and functioning to the typewriter keyboard);

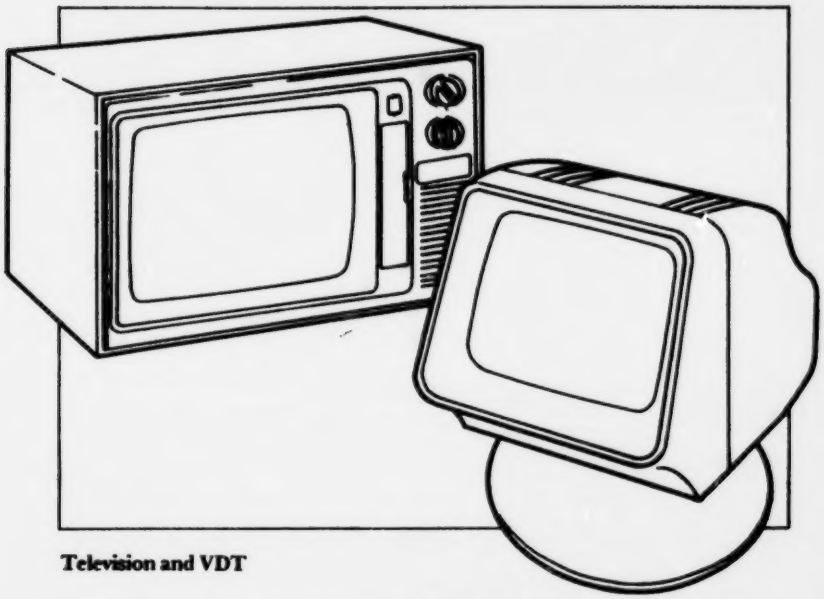


A computer keyboard

- the cassette tape recorder; which both takes in and puts out information;
- the disk drive (a device that rotates the magnetic disks to allow a special part called the head to "read" information from the disk or "write" information there for storage).

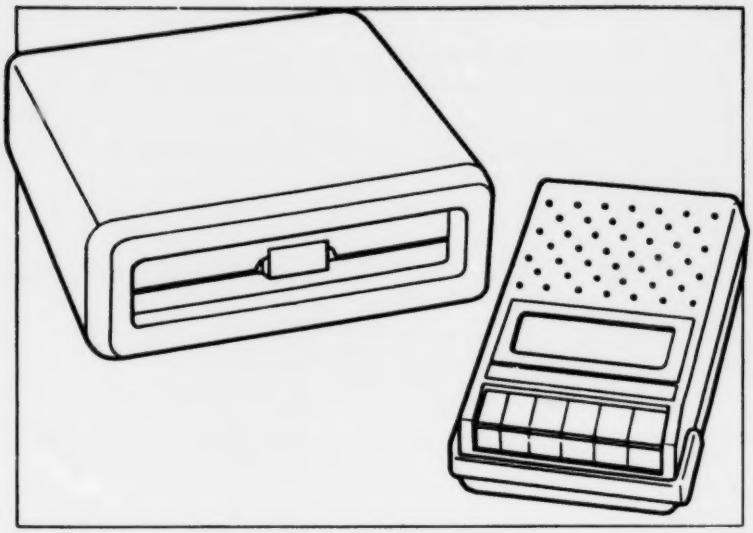
The most common **output** devices used with **personal** computers are:

- the video display terminal, which is similar to your television. In fact, a television set may be used as a video display terminal if special cables are available. Video Display Terminal is usually abbreviated to "VDT". Two other terms are sometimes used to describe VDT: "monitor" and "CRT" (Cathode Ray Tube — the picture tube of a television);



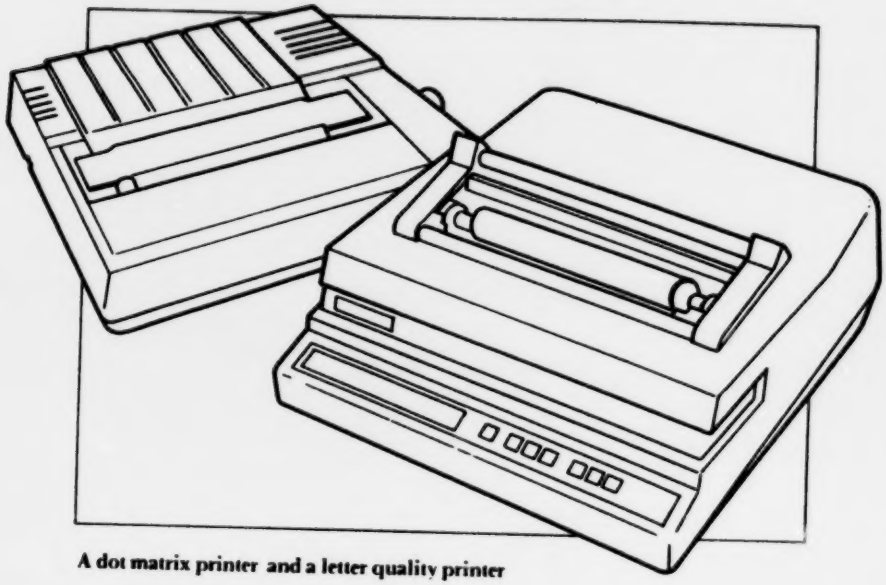
Television and VDT

- the cassette tape recorder and disk drive, which can be used for both input and output. Information can be recorded on magnetic tape or on disks, stored there and filed away in another place; at a later time, these devices allow the user to send the saved information back into the computer for further handling and manipulation.

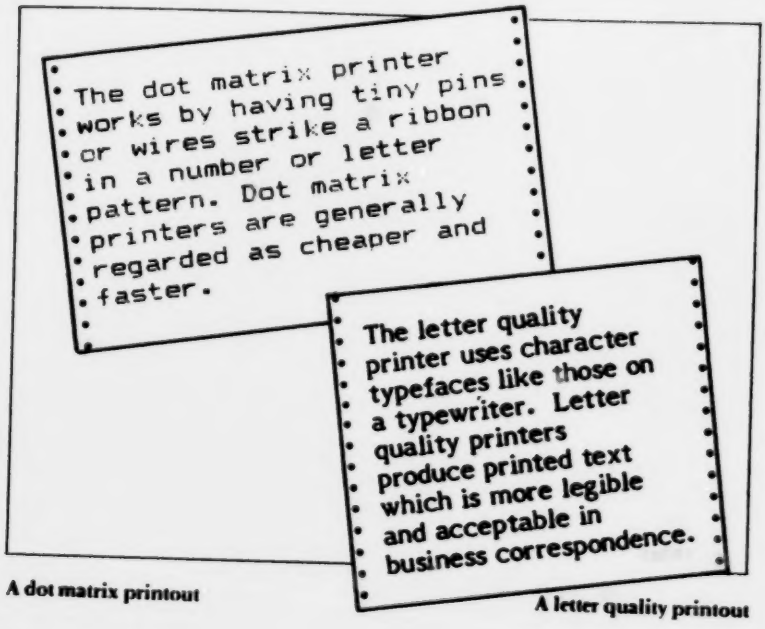


A disk drive and cassette tape recorder

- the printer, which prints the information on paper. The two main types of printers are dot matrix (which works by having tiny pins or wires strike a ribbon in a number or letter pattern) and letter quality (which uses character typefaces like those on a typewriter). At the time of writing, dot matrix printers are generally regarded as cheaper and faster; letter quality printers, however, produce printed text which is more legible and acceptable in business correspondence. The printed output is called either **PRINTOUT** or **HARDCOPY**. There are laser printers now available (and becoming affordable) that produce very high quality printing.



A dot matrix printer and a letter quality printer


The dot matrix printer works by having tiny pins or wires strike a ribbon in a number or letter pattern. Dot matrix printers are generally regarded as cheaper and faster.
The letter quality printer uses character typefaces like those on a typewriter. Letter quality printers produce printed text which is more legible and acceptable in business correspondence.

A dot matrix printout

A letter quality printout

The Input/Output (I/O) devices are used to communicate information to the computer or to send information out from the computer. Without these devices, which input software and the data to be handled and then output processed information, the computer would be directionless and useless. To be useful the computer has to be able to accept/receive ("access") software, follow the listed instructions, and direct processed information to a designated output device. To accomplish this, there are three main components in the computer:

- memory
- arithmetic-logic unit
- control unit

These three components, contained in the intricate circuitry of the computer's chips, make up what is known as the Central Processing Unit (CPU).

The **MEMORY** chips are divided into two types. The first, the permanent memory, is called the Read Only Memory or **ROM** (rhymes with "mom"). The directions and information on the ROM memory are usually a permanent part of the computer system. The other memory is called the Random Access Memory or **RAM** (rhymes with "ham"). This is a blank memory which can receive information and sets of directions from the input devices. Once the information or directions are placed on the RAM memory the computer can follow the directions or process the information. The contents of the RAM memory are temporary; as soon as the computer is turned off, the RAM memory becomes a blank memory pad again. This is changing, in that "smart RAMS" are being developed where the chips are attached to tiny batteries that supply electricity to the chips, thereby retaining the data even if the computer is turned off. However, these smart RAMS are expensive and not yet generally available.

The **ARITHMETIC-LOGIC UNIT** of the computer is really the brains of the computer. Not only can it do all mathematical calculations but it also uses logical commands to do systematic comparisons of the data. By making comparisons

(for example: larger or smaller, yes or no), the computer can make decisions by following the instructions of its program.

The **CONTROL UNIT**, the third major component of the computer system, is required to supervise the functioning of the machine as a whole, calling into operation the other units as required by the program. It receives the program instructions one by one in sequence, interprets them, and sends out appropriate control signals to the various units.

How the Computer Handles Information

All information that is typed into the computer, whether it is a letter or a number or a punctuation symbol, is translated into a number. The number code used by the computer is based on the binary system, which uses only the digits 1 and 0 (instead of our usual decimal or "base 10" system of counting by 0, 1, 2, 3, 4, 5, 6, 7, 8, 9). With the binary system, the code then moves to the next column for 10 through 99, adds another column for 100-999, etc.

Our Counting System (Human Readable Code)	The Computer's Counting System (Machine Readable Code)
0	0
1	1
2	10
3	11
4	100
5	101
6	110
7	111
8	1000
9	1001
10	1010
11	1011
12	1100

The main, and most important advantage of using the binary system in computers lies in two things. First, the numbers that are used can pass through much simpler electronic circuits very rapidly because the electrical current

can be switched on or off extraordinarily quickly, thanks to the design of the silicon chip and its circuits. An "on" is read as the "1" and an "off" as the "0". An on or off situation lasts 1 nanosecond, or 1 billionth of a second. Secondly, we can use these numbers in ways other than just counting or even other mathematical tasks. Since it has been decided that all computers will use only "0" and "1", we now have a standard way in which to communicate with the computer.

When the 0s and 1s are in the computer circuits they are not referred to as numbers. Instead, they are referred to as "bits" because each represents literally a "bit" of information. The computer uses these "bits" to create what is the equivalent of words. Each of these "words" is eight bits long and are called "bytes". By stringing different groups of "bytes" together we then have the foundation for a computer language with which we talk to the computer, and convey to it the information we wish to have either stored or transformed.

Of course, it is a simple matter to make a code to translate numbers for letters or whole words. One of the most widely used of these codes is called ASCII (pronounced "askey") which stands for American Standard Code for Information Interchange. In this code, each letter of the alphabet has its own number, as do numeric characters like 0-9; special command phrases also have their own characteristic number. When each of these letters or control terms is typed into the computer according to its regular number, the computer then reads it in binary form and sends it on to be processed. The following are examples:

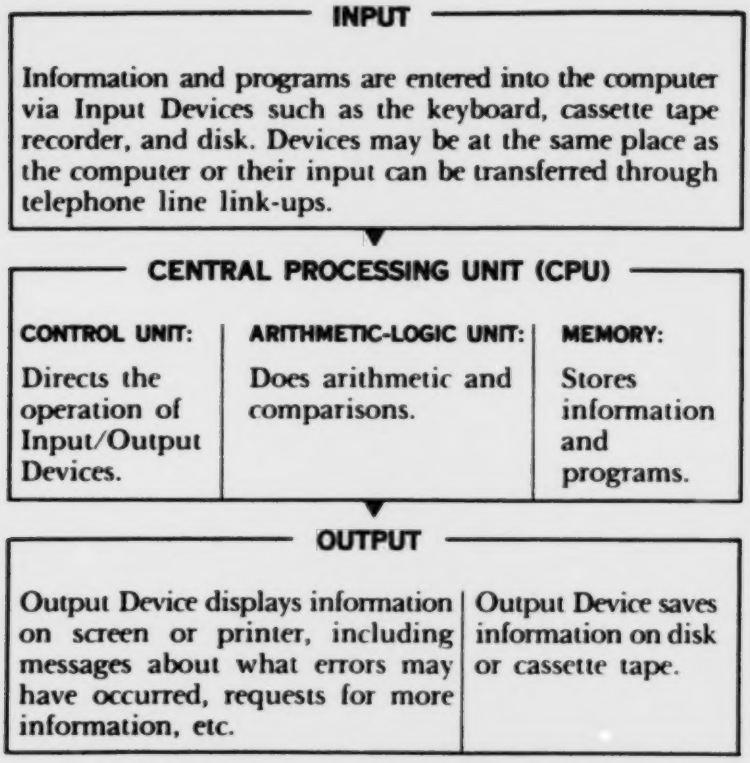
- A equals ASCII code number 65, which equals 01000001 when read by computer;
- B equals ASCII code number 66, which equals 01000010 when read by computer;
- "carriage return" equals ASCII number 13, which equals 00001100 when read by computer;
- "start of text" equals ASCII number 12, which equals 00000010 when read by computer.

Because the letters as well as the numbers are stored in the binary code, the computer can process information simply by comparing numerical values. The arithmetic-logic unit can, for example, put a list of names into alphabetical order by comparing the numerical coding of the letters of the names. By repeated weighing of the numerical value of the coded names, the computer generates the ordered list.

Work stations called terminals are where people perform the information processing tasks of which the computer is capable. A **TERMINAL** is a device that allows a person to "talk" to the computer and receive information. It usually consists of a keyboard, a video display and/or a printer, and is connected directly to the Central Processing Unit.

A **SMART TERMINAL** is one that has a built-in microprocessor which permits the user to have greater control over data received and sent, and to perform certain functions (such as storing or retrieving information that is normally associated with a "stand alone" computer). A personal microprocessor has a smart terminal. A **DUMB TERMINAL** is one of perhaps many terminals that is hooked up to a single computer where the actual processing of information takes place. The terminal is used only to input or receive data processed by the central computer. (Terminals in shopping malls, which give information about tourism or recreation, are examples of dumb terminals as are those used by bank tellers or travel clerks.)

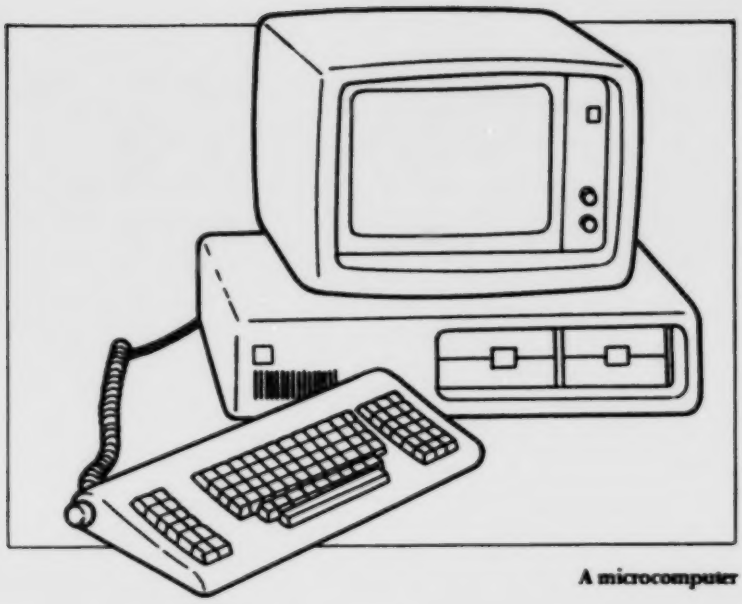
How Computers Work


INPUT
Information and programs are entered into the computer via Input Devices such as the keyboard, cassette tape recorder, and disk. Devices may be at the same place as the computer or their input can be transferred through telephone line link-ups.
CENTRAL PROCESSING UNIT (CPU)
CONTROL UNIT:
Directs the operation of Input/Output Devices.
ARITHMETIC-LOGIC UNIT:
Does arithmetic and comparisons.
MEMORY:
Stores information and programs.
OUTPUT
Output Device displays information on screen or printer, including messages about what errors may have occurred, requests for more information, etc.
Output Device saves information on disk or cassette tape.

Micros, Minis, and Mainframes

Computers are generally divided into three categories: micro, mini, and mainframe, according to size and "power" (the amount of material that can be processed and/or stored).

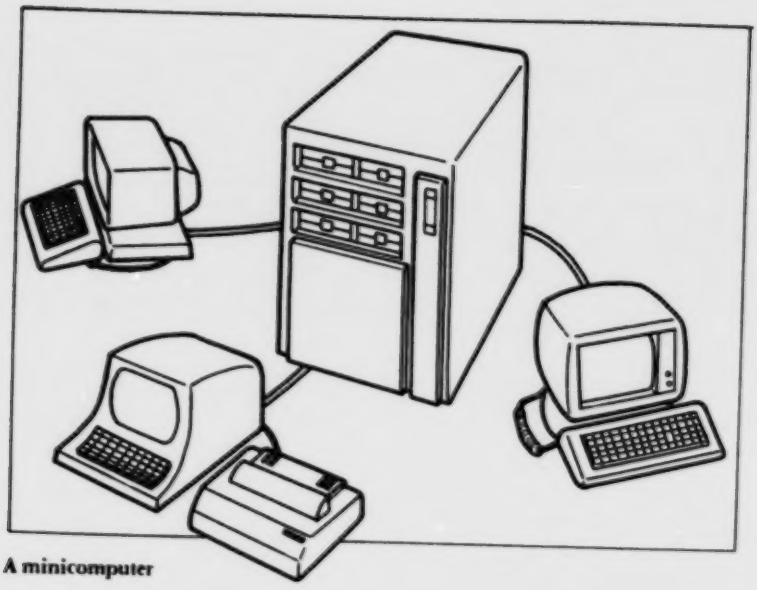
Usually, a micro is a computer that allows input of data, processing of data, and output all in one work station. It is used by one person at a time. Since this work station is self-contained, and because, ordinarily, a micro is not connected to another computer, these computers are often referred to as "stand alone computers".



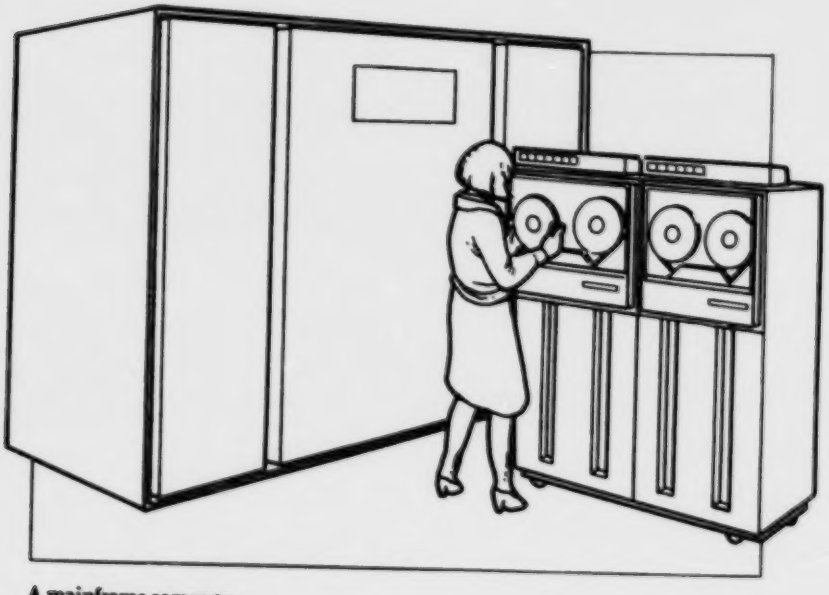
A microcomputer

A minicomputer is usually a computer with a larger RAM, a larger processing capacity, and other peripherals (disk drives with larger storage capacity, printer(s), a tape drive, etc.). It is similar to a micro in that it can be a "stand alone". More characteristically, however, several terminals are connected to one mini. The machine's larger capacity and different software allow work to be done on a number of terminals at the same time, thereby permitting several users to share/access the machine simultaneously. One person may be doing word processing, another drawing up lists, and another doing some statistical analysis. This is known as time sharing in the computer world.

These definitions of computer types contain words like "usually" because the definitions keep changing as the technology expands and develops. For example, there are now microcomputers that have several terminals, whereas a few years ago only large computers could support more than one terminal.



A minicomputer



A mainframe computer

A mainframe computer is usually a large computer that is located in a special room containing the computer, tape or disk drives, and high speed printers. In many ways the mainframe is simply a larger computer with more capacity for storage and processing. As with micros and minis, the mainframe is not useful until software is added through an input device which is also a disk drive using hard disks. These hard disks are not as portable as floppy disks, but they have larger capacities and can hold more information. They are also better protected from environmental damage.

Your Electronic Assistant

Here is an example of how a microcomputer might be used to help collect and work with a large amount of information.

Suppose you were on a committee that was having a conference on "Computer Education for Girls" in which many people with differing skills and interests will be participating. Having your own computer (operating from a "smart terminal"), or having complete access to one, can be a central part of your preparation for the conference, for carrying out the conference activities and for the follow-up required by both the organizers and the participants.

If it is a conference for which money must be raised, for which registrants must pay, and for which there must be an accounting, then at least two types of software packages will be required. One will handle accounting and the other, a database program, will handle the people. Handling the people means acquiring and inputting information that includes who will come, their phone numbers, addresses, and lists of travel requirements, and any special interests or areas of expertise.

From this kind of information, it will be possible to extract specific sublists of people; for instance, who will need hotels for how many nights. This list can be used when negotiating with hotels for dates and favourable rates. Room can be made on the information sheet that is mailed out allowing

people to ask questions or make comments (for example, "check on X date to see if one or two people will be leaving from this group" or "write letters to people who say they need child care and tell them whether there is a fee"). These can be put into the computer for future reference and practical use.

Assuming that the computer you select has a word processing capacity, then any written material (forms, reports, memos, letters) can be produced by the computer. This is an ongoing task throughout any project such as a conference.

When the conference begins, the computer plays a role in registration, in that you can enter into the database the names of all registrants, note who has paid what and when, who hasn't showed up, who came late, etc. It can also generate their name tags. This kind of information allows you to cross-check with your pre-registration list, making sure no one pays twice or doesn't pay at all, re-checking hotel information, comparing flight information that you have with what the participant has, etc. All of these can be done on the spot, if your computer is portable — and many are. The portable, of course, can be linked to a computer with a larger capacity back at your office, or at the office of the person or group which is the main organizer of the conference.

Some groups, like the Canadian Advisory Council on the Status of Women, purchase conference-organizing services from a contractor who does all of this herself, working within the budget and content guidelines of the Council. This can be very efficient for a group which has few conferences and thus is not equipped to handle such a complex operation itself. The contractor has the expertise, the contacts, and the equipment — such as computers — with word processing capacities, etc.

As the conference continues, the word processing capabilities of the computer come to the fore as resolutions can be entered, printed, copied, and distributed very quickly. The same is true for doing minutes of the meeting, or last-

minute agenda changes, or any other kind of written material that must be created and distributed right on the spot.

After the conference, the computer can be used for follow-up of several types. The organizers may wish to compare who was invited with who actually came. By comparing lists of before and after, they can answer questions such as: what type of interested person or group showed up most, did distance seem to affect attendance, did people seem to arrive a day later or leave a day early, and does that say anything about scheduling or content?

Conference minutes or overall proceedings can also be prepared on the computer. They can be sent to all participants or lists can be made of all who were contacted initially, whether or not they came. Alternatively, participants or just leaders of seminars might be sent only the proceedings. Whatever it might be, the computer has the information right there, ready to be mixed and matched according to what is needed.

Of course, the success of all of this depends on carefully and fully setting out your information needs **at the very beginning**, and then making sure that each bit of information put in is complete and accurate. If either the programmer makes or the input information has errors, your end report or output will also have errors. Computer vocabulary has a word for this: GIGO — Garbage In/Garbage Out.

A single microcomputer can be a useful tool in itself, but computer technology is even more useful when the machines can be linked together in order to share information and work. Different sizes and types of computers can be linked together to achieve your goals.

A **MODEM** is a piece of equipment which permits the computer's binary digits (0s and 1s) to be transmitted over telephone lines. In general, two modems are required for the transmission of computer information:

- one at the sending end, to convert the binary digits to sound tones for telephone transmission;

- one at the receiving end, to convert the tones back to the 0s and 1s understood by the computer.

If computers are close (within the same building, for instance), they may be directly linked by wires. **COAXIAL CABLE**, the same type of wiring used to connect television sets to cablevision services, can be used to link computers which are in close proximity (a few hundred yards or less). As well, computers which have large processing capacities (most often minis and mainframes) can support numerous terminals which are wired directly to the computer. Normally this type of direct connection is used when a number of computers or terminals are located in the same building.

If, however, the computers and/or terminals are at a greater distance — across town or across the world — other connection modes must be used. These can be linked by telephone microwaves, or even by satellite hookup.

Creative use of different types of computers, and of the possibilities for linking them together, makes it feasible to design a network of computers. Here is an example of this type of arrangement, called **DISTRIBUTED PROCESSING**.

Suppose the government decided to give the Canadian Advisory Council on the Status of Women funding to computerize their operations such that it could link up with all the women's groups across Canada.

To begin with, the Council might set up a mainframe computer in its Ottawa office. Because of its extremely large capacity, the mainframe could be used to process information sent in by hundreds of women's organizations all across the country. One task the mainframe could do, for example, could be to maintain an information bank which would allow cross-referencing of the skills and expertise of every member of every women's group in the nation. If a group in Alberta wanted to locate a woman in western Canada who could lead a workshop on "Effective Lobbying", that information could be easily accessible from the mainframe.

The Council would read out the information and send it to the Alberta groups. This, of course, would be only one of many functions the mainframe would perform.

If the funding was generous, each provincial or regional group would have its own computer, perhaps a minicomputer, connected to the Council's mainframe via a telecommunications link. Thus, the Alberta group could communicate directly with the mainframe in Ottawa to ask for information when and as it was needed. Most of the time Alberta's computer could be handling the group's own computer needs, but it could communicate with Ottawa when necessary. While the Alberta group is communicating with the mainframe in Ottawa, so are dozens of other women's groups, accessing that same computer at the same time for a variety of purposes via their own minicomputers. Local women's groups or individual women who own microcomputers with modems could also join the network to contribute up-to-date information and to draw on the data in the larger computers.

Making the Computer Work for You

With any machine you buy or use, the assumption is that it will work for you. Similarly, a computer is simply a tool that will do tasks for you that are within its abilities. You, the user, can decide what you wish the computer to do for you.

The nature of the machine, at any given moment, is defined by the software which instructs it as to particular tasks. Thus, your decision about what you want the computer to do for you is really a decision about software.

Thousands of software packages have been developed for use on all kinds of computers, and new ones appear almost daily in what is a very competitive marketplace. Many of these packages, however, are variations of three main computer activities which average users find most advantageous.

Word Processing

Word processing is one of the many things your computer can do for you. This type of software package is most useful to people who want to use the computer to simplify and speed up writing and typing tasks.

Word processing allows the typist to delete words, phrases, paragraphs or whole pages without having to use correcting fluid. It also allows the typist to move passages around without needing scissors and tape. All the rough work of writing can be done on the screen; instead of cutting and pasting to change paragraph 3 to paragraph 1, that manipulation can be done on the computer. All typing errors and other corrections can also be made on the screen. Only the final draft needs to be printed out. Letters and documents created using word processing can be stored on a disk for later revision or to be used again in a modified way. This will reduce the need for tedious retyping of the same or similar letters and reports. Another feature of word processing is that "boilerplate" phrases can be stored and then be called up for insertion as needed. An example would be in a

legal document where clauses 1, 8, 12, and 23 are needed for a specific document; these phrases can be called up and inserted on demand, eliminating the need for retyping.

Your computer can become a word processor when you insert and load word processing software. There are numerous well-known word processing software packages; deciding which package is the best one for you is a consumer decision which, like other consumer decisions, requires comparative shopping and research. There are also specialized computers that only do word processing, called "word processors". Word processors are referred to as "dedicated computers" because they are only used for that one function.

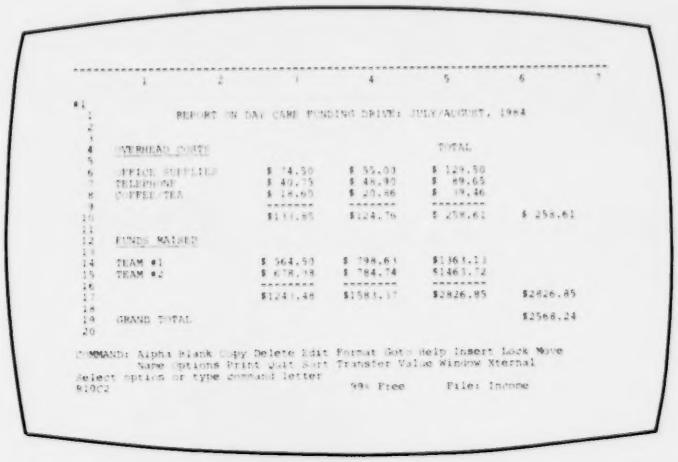
Although the word processing program is very complicated, on the computer it operates using the same principles as any other program. The arithmetic-logic unit is used to compare the coded letters to decide what you want it to do. If you input a command to the computer via the keyboard to delete a line in a report, that command is translated into binary code and then "read" by evaluation of its numerical value. Once the computer "understands" that command, the computer is directed to delete a line in your letter or report.

Number Processing

If you want to use your computer to deal with numbers, number processing will be useful. Many number processing software packages, called "electronic spreadsheets", are available for computers that have sufficient memory capacity — 64 K (approximately 64,000 bytes). Although most personal computers operate with bytes which consist of eight binary digits ("bits"), the trend in the industry is to larger bytes containing 16 or 32 bits because larger bytes allow faster processing and an increased memory size in the computer.

The number processing software changes the computer's memory into a large worksheet. Most worksheets have at least 64 columns and 254 rows, and there are even larger spreadsheets available. Since the worksheet is so large, the monitor screen on the computer becomes a "window" through which you can view a portion of this worksheet at a time. On a worksheet you can store information, alter it, delete it or replace it with a few easy-to-learn commands.

What the electronic spreadsheet program does is to provide you with a means of defining how this information will be used. For example, you can create a general ledger on which you define rows (down) of information, such as names, dates, addresses, etc., and columns (across) of numbers. After you have placed this information, via a very convenient display on the terminal, into the computer, you can then instruct the computer to add, subtract, multiply, or divide the numbers you have used, giving you the totals. Finally, the program can print out your information which can be used as a permanent record.


REPORT ON DAY CARE FUNDING DRIVES JULY/AUGUST, 1984
OVERHEAD COSTS
TOTAL
OFFICE SUPPLIES $ 74.50 $ 55.03 $ 129.50
TELEPHONE $ 49.75 $ 46.90 $ 69.65
COFFEE/TEA $ 16.60 $ 20.66 $ 19.46
$131.85 $124.76 $ 258.61 $ 258.61
FUNDS RAISED
TEAM #1 $ 564.50 $ 796.61 $1361.11
TEAM #2 $ 678.18 $ 784.74 $1462.72
$1241.48 $1581.17 $2826.85 $2826.85
GRAND TOTAL $2568.24
COMMAND: Alpha Blank Copy Delete Edit Format Goto Help Insert Lock Move
Name Options Print Quit Sort Transfer Value Window Xternal
Select option or type command letter
99% Free File: Income

A typical "spreadsheet" program

In addition to operating like a calculator, an electronic spreadsheet can store formulas. This means it can be directed to add the information on one cell of the worksheet to another and present the sum in yet another cell. For example, if you had entered the cost of an item in one cell and the tax of that item in a second cell, the computer could be directed to sum those two items and place the answer in a third cell. Because the content of the third cell is linked to the first two cells, any alteration of the initial numbers will automatically modify the contents of the third cell. This means that number processing is capable of recalculating mathematical operations simply by changing the initial input numbers. Think of an end-of-month timesheet that is redone each month. If the timesheet were made into an electronic worksheet, only the numbers would need to be modified each month. The totals and perhaps total wages would be recalculated immediately to reflect the data of the present month.

Databases

Organization of information is one of the most important uses of computers. Through computerization, the user can have almost instantaneous access to any part of a large body of diverse information. A **DATABASE** or **DATABANK** is a systematically organized body of information stored in a computer and arranged to allow very quick access to all data or information.

We are all familiar with the telephone book which is a traditional source of information of the names, addresses, and phone numbers of all phone subscribers. It uses a printed medium and information is accessed by using the alphabetical system of last names. The traditional phone book, however, will not allow you to find a particular name, address, and phone number if you only have the address. In order to use the phone book, the only "key" to access is last name.

When creating a database for a phone book, it would be useful to access the information by using many keys. In fact, a **RELATIONAL DATABASE** can easily be created which will permit access to any particular listing (called a **RECORD**) in your new computerized telephone "book" by the key of last name, or first name, or address, or phone number.

In addition to a relational database, there is a **HIERARCHAL DATABASE**. In a relational database all parts of the records are considered equal; you can retrieve the same record if you know the last name, the address, or the phone number. In a hierarchal database, information is graded from general to specific. Using a series of "menus" (lists which require a choice to be made), you go through a process to narrow down the topic so that you identify to the computer exactly what part of its information bank you wish to access. Using a "menu driven" system you could find out about women's programs at your local community college in the following way:

First, you would see MENU 1:

MENU 1

1. Education
2. Legal
3. Medical
4. Computers
5. Science

You would select number 1 — Education. As a result of selecting education you would see a further breakdown:

MENU 2

TOPIC: EDUCATION

1. Elementary
2. High School
3. University
4. College
5. Community Sciences

You would select number 4 as you are concerned with education at a community college. Then you would see a third menu which would define the geographical area and so on. Eventually you would narrow those menus down until you found exactly what you wanted.

Using a database for a college in your own city is not an efficient use of your time. A phone call would have been faster. However, if you wanted to know more about women's studies in several distant areas, the computer would allow you to accomplish your research in a relatively short amount of time.

The previous examples are only a few samples of the great variety of software packages available for microcomputers. There are literally thousands of such packages on the market today to meet almost any need a user can identify. Most computer sales outlets have catalogues of software packages. An afternoon's browsing through one of these is a worthwhile investment of time for anyone curious about what exists in the software market. Many of these are games packages, and many of the others are "new improved" versions of the packages described in the previous pages. Highly successful software can be quickly pirated by other manufacturers, who make slight modifications and release competitive packages.

Some of the most interesting software includes educational packages designed for children and adults. As well, packages that scan a piece of writing and highlight possible errors will be a real aid for people who have difficulty with spelling and/or grammar.

In addition to buying pre-packaged software, you can also hire a programmer to develop a specific piece of software for some specialized application. The expense of such a development process makes it more likely that large businesses and organizations, rather than individuals, would develop customized software applications. Computer hobbyists can and do, however, develop their own creative software for personal and business use.

If you select or create the right software for your project, your ability to do the task in a more complete and efficient manner might increase. The computer is just another tool that should allow you to do exactly what you want to do.

What the New Technology Means to Women

Knowing how the computer works gives an insight into what kinds of tasks it is likely to do very well, and by implication, what kinds of uses we are likely to make of it. Because the machine's strength is in following step-by-step instructions very quickly and accurately, we can predict it will increasingly be set to work doing:

- repetitive tasks;
- calculations (including any activity which can be reduced to a calculation, such as alphabetizing);
- storing large amounts of information and then searching rapidly through that information to find specific items, compare items, match items, analyse items according to a set of instructions, put items in order, and so on;
- operating mechanical "arms" or "robots" to perform repetitive mechanical functions;
- monitoring any ongoing condition or activity and intervening (according to instructions) when the condition changes or the activity alters;
- imitating any human activity which can be translated into step-by-step procedures (such as creating designs or drawings for example, when all the specifications and parameters have been previously identified).

A Not-Very-Bright Machine

At first glance it may seem the computer's skills are not all that impressive, and in fact, compared to the complex and wonderful

functions of the human brain, even the best of these machines is amazingly dull and limited in its abilities. What may not seem obvious at first glance, however, is just how many human tasks can be broken down into sets of very simple instructions which, repeated over and over again with variations, can be performed by a not-very-bright computer.

Think of it this way. Consider, for a moment, all the things you do in the course of a day, week, month, and ask yourself which of these things require:

- doing the same activity again and again because there is some change in information (e.g., re-doing a list because addresses have changed, "looking up" some forgotten or unknown piece of information in a dictionary, catalogue or file);
- doing repeated calculations when only the numbers are changing, not the basic operations (e.g., re-doing a payroll because the tax rate has changed, comparing the effects of differing interest rates and time periods on a loan);
- sifting through printed information to find a needed item (e.g., going through a membership list to locate members willing to billet out-of-town guests at a workshop);
- retyping or having a document retyped because a small revision is needed (e.g., retyping a 10-page report because the information on page one has been revised and will no longer fit on page one);
- keeping and updating the same information in more than one place (e.g., a membership list, a mailing list, a donor list, and a committee list — where the same names may appear on more than one list);
- doing the same physical activity over and over again (e.g., turning a thermostat up and/or down at a specific time each day);
- doing any other task which is repeatedly done the same way.

Any task you do which fits the criteria listed above is likely to be one which a computer can do (or help YOU do) faster and more accurately than it has ever been done in the past. Actually, since most of these activities are usually uninteresting, unchallenging, and not a good use of human brain power and talent, **all other things being equal**, most people would be happy to consign such work to a machine which doesn't care how time consuming the operation is or how often it has to do the same thing over and over again.

The Problems for Women

The difficulty arises, especially for women, because all other things are not equal. While we might gladly consign such work to computers, we will not be happy to do so at the expense of our paid jobs, our privacy, our health, our relationships with other people, our gains toward equality, and the peaceful future of our world.

The following eight sections of this book examine areas in which the new technology may have its most profound impact on women's lives. Because new developments are occurring almost daily in the high technology field, specific predictions about exactly how computers will affect us are not possible; nonetheless, the general trends are already clear. As well, since the computer offers us a mixed bag of tough problems and delightful possibilities, the difficult task of presenting a balanced view of the pros and cons is attempted in each of the following sections:

- Computers and Women in the Workplace
- Making Your Home Your Office
- Computers, Families, and Homes
- Computers and Education
- Women's Health and the New Technology
- Revolutionizing Play
- Electronic Invasion of Privacy
- Women, Computers, and the World

Computers and Women in the Workplace

Heather Menzies' excellent work has already documented for us just how profound an effect the new technology may have on women's employment.[1] Simply put, our history in the work force is on a collision course with the future. In the past, women disadvantaged in the work force were largely relegated to jobs which included much routine work. This supportive work force freed up the powerful to make decisions and "run the show". However, the development of inexpensive machines which can do routine jobs more quickly, accurately, and with fewer workers will reduce the need for women in support positions. Will women in support positions be squeezed out?

So, as our past in the world of work meets the future — i.e., the computer — many women will almost certainly be the net losers.

Some women in support occupations will lose their jobs and be faced with the poverty and isolation that come with unemployment. Other women will find that, while their jobs as such don't disappear, the nature of those jobs will change significantly.

The technological revolution will affect not only women who do paid work. It is also true that many men will find they face similar problems in the workplace. The point is, however, that while general technological change will affect a broad range of occupations and people, the computer in particular will almost certainly have a concentrated negative effect on a cluster of occupations which have provided employment mainly for women: secretarial and clerical jobs,[2] and service occupations such as telephone operators.

Will this serious effect on women's employment receive an appropriate amount of attention when policy and decision-makers address the effects of technological change? This has not been the case so far, and women must make sure that their situation and concerns are clearly addressed.

As an illustration of how office automation can affect women's jobs, let us create a fictional company which is just slightly ahead of its time.

The firm is a brand-new Canadian manufacturer of high technology equipment. Since it is a new firm, and because it is computer-oriented, its offices look very different from what a person would normally expect to find in a medium-sized manufacturing operation. Each manager and executive has a computer terminal in his office (the term "his" is used because, if our example is to reflect the Canadian reality, most of the senior positions in the firm would be filled by men). On joining the company, each manager is given a course in "keyboarding skills" (a term many men prefer to "typing") and a quick lesson in word processing.

All internal written communication in the company is done by the managers themselves on computer. For example, if one executive wants to send a memo to another, he types it into the computer which alerts his co-worker that a message is waiting in the machine's memory (the "electronic mailbox"). Even internal company documents which must be sent to the London, England office are handled in this manner, because there is a telecommunication link-up with that office.

From time to time, someone working for the firm may want to send a letter or report to another organization which does not yet have the technology to receive the message via computer. When this happens, the executive will type the document into his computer terminal, and when he has completed it, he will command the computer's printer to print out a paper copy of the document.

This fictional firm's requirements for secretarial and clerical workers, although not eliminated, would certainly be greatly reduced in comparison to most businesses of the same size. Some office workers would still be needed for telephone and reception duties, for sending and receiving conventional mail, and especially to perform jobs necessary for the operation of the automated equipment, such as "backing up" (making copies of disks in case of accident or fire and re-supplying the printer with paper). As well, a few excellent typists might be employed to proofread, edit, and improve the appearance of important documents typed into the computer by executives.

Very few business concerns have embraced computer technology to the degree this fictional company has. It is a new organization which does not have to replace existing equipment or retrain existing managers to do things in a new way. From this example, however, we can catch a glimpse of what the future may hold:

- the elimination of many, if not most, secretarial and clerical jobs; and
- the downgrading of many remaining office jobs.

While the secretarial and clerical fields may be the ones which are most immediately and hardest hit, any kind of job which entails doing the kind of activities outlined earlier in this chapter will be increasingly at risk as computers become cheaper, more available, and easier to use.

The situation gives rise to a number of questions which individual women and groups of women cannot put off addressing:

- How long will it be before the "office of the future" (like the one described in the example above) becomes the norm rather than a futuristic oddity?
- What kinds of jobs can be created to replace the ones which are lost?
- What groups and individuals should be encouraged to take

action so that women won't be squeezed out of the workplace or their jobs downgraded?

- If computers can take on the more routine tasks associated with many jobs, how can we ensure that the working time gained as a result will be used creatively instead of eliminated?

What women need is for computers to take on the unchallenging, routine aspects of women's jobs, so that women can do new jobs which finally make use of their creativity and talent.

Women do not need computers to take on the unchallenging, routine aspects of women's jobs, so that there are not very many jobs left for women.

The last section of this book suggests some strategies individual women and groups can adopt to protect women's jobs, but in the final analysis, it will take efforts on the part of all members of our society to deal with the massive changes microtechnology in general and computers in particular will bring about.

The problem is a human one; having invented a machine which can do part of the work that we need done, what can we set ourselves to do instead? If we can get a cheap machine to do what people have been paid to do in the past, what shall we pay people for doing in the future? The futuristic view of half the people (and more than half the women) unemployed, unutilized, and unpaid, looking on while the lucky few, using a clutch of machines, accumulate all the wealth and all the power is clearly unacceptable.

What is needed is a massive re-definition of work: what it is, who does it, where it is done, how people get paid and for doing what? Furthermore, what is needed most of all is for women's voices to be heard and included in that redefinition.

Computer technology is going to change the nature, then, of work and the workplace. The issue, especially for women, is not **whether** change should occur, but how to ensure it can be **instituted positively**.

Again, the machine itself and an understanding of its capabilities give some insight into how the characteristics of the offices and workplaces of the future could, if the right approach is taken, be of some benefit to women rather than disadvantaging them.

Displaced workers could move into new and more creative areas of work instead of being eliminated. If we start with the proposition that workers are going to be freed from labour-intensive, time-consuming, repetitive work, we can equally well reach the conclusion that such workers could begin doing work in other areas which, up till now, have been neglected or overlooked. For instance, when the burden of paperwork has been relieved by the computer, human time might well be used in ensuring better communication with the public, improved research and information, better human relations on the job, more scrutiny of product quality — in short, the delivery of better goods and services in almost every field of endeavour. The advent of the computer does not mean that we have to continue doing the same job activities the same way with fewer people; it could just as well mean we can look forward to improvements in every field where computers free up people's time and abilities to make those improvements.

Since computers will take on much of what has been paid human work, the resulting savings in salaries could be applied to human work which has, until now, not been remunerated. The argument against paying homemakers and mothers for the staggering amount of work they do has always been that there is simply not enough money to go around. If cheap, reliable machines begin to take on paid human work, the money that is saved in salaries will go somewhere; perhaps it can go to paying for work which has always been done but rarely paid for.

The quality of work life for women whose jobs are not at risk may improve considerably. The computer has the capacity to ease the workload and make work more pleasant and interesting. People who complain about "drowning in paperwork" or doing the same task over and over again on a regular basis have good reason to be excited about the possibilities the computer presents. For busy working people in particular, the computer may make it possible to manage the impossibly complicated business of juggling career, home life, parenting, and personal needs. A computer at home, linked to the one at work, could allow a parent — mother or father — to remain at home with a sick child and still put in a day's work. A computer at work, linked with one at the bank, could allow a busy person to pay bills and transfer money without leaving home or office. Computer terminals in two people's homes would allow job-sharing in a new sense of the word. Work could become a flexible activity, done at convenient times in convenient locations.

Making Your Home Your Office

Bringing Your Job Home

A computer terminal or a microcomputer in the home may make it possible for many women to work from their homes instead of their offices for a good part of every work week. In some occupations, the only real need for going to a central location is for meetings or conferences, which occupy a relatively minor part of working time. The implications of a working arrangement which allows for such flexibility are both positive and negative at the same time. The positive implications are:

- Working hours can be more suited to the individual's own preferences and constraints;
- Travelling time might be reduced;
- Stress levels might be reduced, because less time would be spent in stressful office environments, and because women with conflicting demands on their time would have more freedom in their scheduling;
- Productivity might increase because employees could feel happier in general about their work;
- If the world of work is no longer confined to rigid shifts or working days, the possibility of individuals negotiating their own tailor-made agreements could increase.

On the other hand, the negative implications are:

- The possibilities for exploitation in a new kind of "piecework" industry are unsettling (women with terminals in their homes might find themselves permanently "on call", working when and as the employer preferred it);
- Isolation and feelings of being cut off from other people and from the information available in a central workplace could be a real problem for women who spent a large part of the work week at home;
- Women might find themselves more harried than ever. After all, one of the pleasures of going out to work is in being able to leave a hundred and one other responsibilities behind for a few hours each day;
- As attractive as it might seem to work at home some of the time, homes are not always peaceful, pleasant places to work. Those who work at home find themselves plagued by phone and door-to-door solicitors, meter-readers, delivery people, and so on — the assumption seems to be that women at home are probably not doing much of any importance anyway.

If technological innovations can be managed humanely and carefully, women have much to gain from being able to do their jobs when and where it is convenient to work. By the same token, exploitation of women workers and increased complication of already-complicated lives are possibilities which women must consider carefully as computers are brought into increasing use.

Running Your Own Business

Freelancers and women who have started their own small businesses run from the home have found microcomputers to be indispensable tools.

Word processing software allows women who are poor or barely adequate typists to produce professional-looking letters, reports, etc., resulting in considerable savings on secretarial services and less wear and tear on the one-woman entrepreneur who must do everything herself. As well, the nature of the computer (a very systematic machine) makes the organizing and managing of a small concern simpler and more effective; writing, typing, editing, filing, and even "mailing" a piece of work are all accomplished in one process, and are generally done in consistent ways which result in overall efficiency.

Electronic spreadsheets (described earlier in this book) make it possible for one-woman or very small businesses to keep accurate financial records without the constant help of accountants or bookkeepers. This can aid greatly in making good business decisions based on up-to-date information. Again, because financial records are stored on disks as part of the process, important figures are less likely to be lost or misplaced in the scramble that is often part of running a small business.

Self-employed women who work out of their own homes must cope with many of the problems and interruptions mentioned in the previous section. However, the microcomputer, in general, can make self-employment easier and more possible now than ever before.

Thus, the new technology, in making paid work an activity which may be done increasingly in the home, would then have profound effects on family and home life. When mothers do not necessarily have to arrange for full-time child care in order to go out to do paid work, when employment can be integrated with other responsibilities in a flexible work day/week, women's home life may undergo a significant change. Whether the change

is for the better will be determined by human beings, not by machines. However, if women are not a large and powerful segment of those human planners and executors of work, they cannot look forward to this future with much hope.

Paid Work — Thoughts and Actions for The Future

When we look at women and their paid work, whether it is done at an office or at a home-based work station, we can see that the advent of microtechnology forces us to focus on an issue which is not new to women: What value does our society place on women and the work they do? What is new are the extreme consequences of not meeting that issue honestly, energetically, and seriously.

As of now, the technology is being introduced to the workplace with little consideration of its medium- and long-term effect. Studies and reports like Menzies' create awareness and concern, but in themselves they cannot alter the accelerating pace of the computerization of work. Every day, another office, another manufacturing concern, another bureaucracy makes its decision to convert its operations; such individual decisions combine to produce an overall trend which is not being met by a consistent and well thought-out response.

Ad hoc planning will not deal effectively with the fundamental and massive change described earlier; rearguard action will not be effective when computerization is firmly established. Unless a tremendous effort to face the issue begins immediately, many women will be the losers, almost by default, when they (and everyone else) might otherwise have benefited from the invention of this machine, which has the potential to enrich and improve their lives.

Computers, Families, and Homes

The extravagant claims made for microcomputers are at their silliest and most misleading in predictions about what will happen to families and households because of the new technology. Articles and documentaries place a computer in every room in the home of the future, helping every family member find fulfilment. A thousand-and-one wonderful possibilities are predicted for those of us who, unlike the dinosaurs, can adapt to a new age.

Usually these computer stories have little concrete to say about what we will actually be **doing** with all this electronic equipment. Somehow, it will all just be there, making our lives a little easier in some vague, undefined way.

What we can probably conclude from this vagueness is that our predictive capacities are negligible. No one knows for sure how computers will be used in homes in the future or what will be the effects on families. What we DO know is what their impact has already been. What we CAN observe is that the computer itself has had far less influence on most homes than the aggressive advertising which has promoted it.

Have I Got A Deal For You

Computer manufacturers and salespeople, with ambitious sales targets for personal/home computers, have created powerful images around their product. They have used the same advertising tactics that are used to sell other consumer commodities: we are told we will be happier, richer, smarter, more attractive, and more socially acceptable if we buy their product. We are given to understand that if we fail to acquire the magic machine, we and our children will fall behind, we will be left out of the future.

Most of us have learned to take with a grain of salt the claim that a new type of laundry detergent will substantially improve our lives, that a new model car will fulfil all our dreams. With computers, though, our consumer awareness is largely disarmed. Our skills at resisting the slick and glossy advertisements for this product are somehow not operating as well as they usually do. Why?

It probably has to do with our lack of experience with computers. While we know about most consumer goods, and we know from experience how to sort through the advertising claims about them, this is much less true for our background with computers. When the advertiser makes a claim, we have no point of reference for considering it.

To compound the confusion in this situation, the microcomputer has become one of **THE** big news stories of the 1980's. Hardly a day goes by without the appearance of another newspaper or magazine article about home computers, and most of these stories are based on the assumption that everyone wants or needs a computer: "How to Buy . . .", "How to Use . . .", "How Much to Pay . . ."

The end product of all the advertising and the hype is an uneasy feeling in many of us that if we don't get a computer fast, we may miss out on something really big. Children, especially, may be subject to these feelings.

A Car in Every Garage, a Computer in Every Kitchen

It seems that men and children are more likely to fall in love with the machine. Their approach is often to acquire the computer first, and to figure out what to do with it later. Having the machine becomes primary, as the advertisers intended — **keeping up** is what is important.

Women are a tougher market to crack. A functional home computer system can easily cost as much as a good used car; women are much more inclined to want to know exactly what benefits they can expect from such a large expenditure. Most computer experts agree this approach is the correct one to take.

The computer is primarily a tool, and should not be largely a toy or status symbol. Although its price is less now than it was five years ago, it will probably never be a minor purchase in relation to most of our budgets. A home computer will continue, for the foreseeable future, to be a major investment for families, and an impossible expense for those with low incomes.

If women are asking the right questions about how useful and valuable the home computer will be in relation to its cost, the answers they are getting fall very short of acceptable. Most salespeople have to scramble to come up with reasonable applications that justify a purchase of several hundred (or even several thousand) dollars. The suggestions they make to women for computer uses do not, by and large, represent the needs and priorities of many women. The following are some of the most common recommended applications for women.

Electronic Recipe Filing: Aside from the assumption that the most important information a woman could want to store and manipulate is her recipes, a box full of filing cards or a cookbook is still a superior way to keep track of such information. It would require hours of typing time to enter even a modest number of recipes into a computer, and there would likely be no material advantage to looking through computer files instead of looking through a cookbook index for a favourite recipe. As well, most cooks would be unlikely to want bulky computer hardware taking up counter space or getting splattered by grease during the cooking process.

Cheque-book Balancing: Again, this is an assumption, and one that reflects the stereotype that women are unable to manage a cheque-book. As well, this is quite simply a fatuous suggestion. It requires typing information into the computer which has already been calculated and written elsewhere, and then using the computer to add and subtract again.

Family Accounting: Unless your family accounts are much more complex than most, the computer would be an expensive and time-consuming medium for family budgeting.

Homework and Schoolwork: The microcomputer does have exciting potential in the realm of education, as will be discussed later in this section. It is difficult to see its economy or usefulness, however, in helping little Mary complete a mimeographed sheet of fractions.

Suggestions like those listed above come from an industry which has a product to sell, but only a poorly conceived idea of its usefulness to the buyer and a real ignorance about the identities and activities of the women who might be buyers.

Fact and Fiction

As women, we have the difficult task of sorting out whether the microcomputer, surrounded as it is with extravagant and insistent promotion, will have any really useful place in our homes. Even if much of what is said about the machine is sales-oriented, we cannot at this point conclude that the machine itself can be dismissed as an expensive and largely useless toy. What has been lacking is creative thinking about realistic applications for families, and especially for women.

If we look again at the characteristics and capabilities of the microcomputer, we see that its strengths lie in:

- storing, sorting through, comparing, and analysing large amounts of information that would otherwise have to be processed laboriously by hand;
- monitoring ongoing conditions or activities;
- operating robots to perform mechanical functions.

Given these capabilities, what might we expect computers to do in our households in the near future?

Writing: Amateur or would-be professional scribblers might be willing to invest the money in a computer with good word processing capability. An equal investment in time would also be required; writing on a word processor is an acquired skill and taste. (Author's note: In our opinion, it's worth it, though.)

Getting Access to Information: Information banks or databases can provide information from their computers to subscribers via the telephone and home computer. Libraries, newspapers, magazines, research organizations, tourist bureaus, weather services, etc., have begun to organize their information so it can be retrieved by a phone call and a series of commands typed into a microcomputer. Some of these services are free to users — such databases are usually providing advertising space to people with something to sell. Most services charge hook-up fees and then bill users for the amount of time they spend using the information in the database.

Having access to such information so conveniently is an attractive prospect. On the other hand, concerns are just beginning to be heard about who these information providers are, and what possible slants or biases their information may contain. At present, there are no restrictions on the accuracy or intent of the information provided by data banks. If a person wanted to start a data bank which presented information items "proving" that the women's movement was responsible for the breakdown of North American families, there would be no requirement that the material be factually correct. The success of the data bank would rest solely on whether enough people were willing to pay to gain access to the information. The quality of the information would be a separate issue.

Information Processing: Some women do have large amounts of data the computer could help manage. For example, appropriate software could help collectors organize and manage large amounts of information about their collections. Any hobby or activity which requires keeping, filing, and cross-referencing large quantities of written information is a candidate for computerization.

House Robots

The most futuristic of all projected uses for home computers is the control of robots or mechanical devices by computer to perform manual work. There is no doubt women would be better

off with a machine to take on some of the cleaning, scrubbing, and dirty-work jobs of the household (in that studies show that women are still forced to assume much of the responsibility for such tasks). What is doubtful is whether any of us will ever have access to such a machine.

To begin with, the expense of house robots will likely remain prohibitive in our lifetimes. Such equipment is making its way into factories now, but the cost of even one device with a very limited range of activities goes well beyond what most families would find possible to afford.

As well, most of the jobs in a household do not consist of merely doing one activity over and over again. Cooking requires chopping, peeling, frying, stirring, pouring, boiling, sprinkling, blending, and so on. Doing the dishes, even with a dishwasher, requires scraping, stacking, setting dials, unloading, sorting, and putting away. There is no house robot invented (or yet even conceived of) which could undertake such complex tasks requiring so much judgement.

Three other types of computer applications are likely to have the most profound effect on families and family life in the foreseeable future. Their importance, especially to women and girls, makes it worthwhile to explore them in depth in the next three sections. They are: education, health, and leisure and recreation.

Computers and Education

If current trends are projected into the future, one area we can expect to see heavily influenced by the microcomputer is education. Local schools, boards of education, and provincial ministries of education have already spent millions of dollars acquiring computers and buying and developing educational software. Even given this massive commitment, high technology experts and futurists continue to warn that the computerization of the education system is taking place too slowly, that graduates of today's system will be inadequately prepared for adulthood and employment. There is tremendous pressure on schools to hurry the process along; there is equal pressure on parents to buy computers for their children to ensure that they will have a head start (or at least an equal chance) in the computerized classroom.

Women are the targets of much of this pressure, for it is women who are still given much of the responsibility for children's

education in our society. It is still, overwhelmingly, mothers who undertake preschoolers' early education, who make the decisions about where and when formal schooling will be started and carried on, who communicate with teachers, who join and support parent/teachers' organizations, and so on. As well, it is women who do the bulk of the formal teaching at primary levels and much of it at secondary levels. At all levels of the education system, men may begin as teachers, but they often move on to become administrators; women educators, more characteristically, spend their entire careers in formal teaching, and are rarely given the opportunity to move into supervisory positions.

Women, then, should be at the forefront in examining the educational potential of computers and in making the decisions about how these machines will be used in the learning process. To date, however, little of this type of questioning is being done by anyone. Women teachers and mothers are, by and large, the last people to be asked whether computers belong in the classroom.

The Education Market

The active sales promotion of computers and software mentioned in the last section is certainly responsible, in part, for the tremendous push to get computers into schools QUICKLY. School boards and teachers are the targets of these advertising campaigns. The message for educators is, "If you want to get more information into more heads more quickly, the computer is THE answer." As well, teachers (like everyone else) are concerned about job security — will the only teacher in the school who does not use the computer in her classroom have her contract renewed? Pressure from anxious parents who want their children to have every possible advantage in schooling accentuates the rush to computerize even further.

A Perfect Teaching Machine?

The computer's promoters, not all of them salespeople or manufacturers, see the potential of the computer in education as almost limitless. A proportion of educators, some of them very distinguished, believe the new technology will revive and renew an education system which has come under increasing criticism in recent years. Seymour Papert, for example, has done exciting work with children and computers which demonstrates convincingly that computers do have a place in the classroom.[3] Papert's approach was carefully thought out; it was based on a clearly articulated educational philosophy and painstakingly developed learning objectives. The computer was viewed as a

tool which, used in considered and consistent ways, could teach children skills of logic, problem solving, and programming.

LOGO, the special computer language developed by Papert, allows even young children to program microcomputers at their very first sitting, in order to "draw" coloured shapes and designs on the screen. What is intriging about LOGO is that it makes learning so enjoyable that children usually cannot resist it. They return eagerly to the machine as it teaches them logic, problem solving, geometry, consistency, and creativity with such patience and good humour.

LOGO is one of a number of approaches which exemplify all that is best about computer-assisted learning. With good educational software, the machine allows for truly individualized instruction — learning that takes place at the learner's pace, at the learner's convenience, and at the learner's own level of need. Excellent learning programs can accommodate very bright people and those who learn much more slowly, or who have specific learning difficulties; the machine does not care how quickly it goes through a program or, on the other hand, how many times it is asked to do the same steps over and over again.

However, the machine will never replace the special quality of good human teaching because learning is as much a social experience as it is a matter of absorbing content. People learn at least as much from each other as they do from books, exercises, research projects, or drills on computers. A learner stuck in a corner with a computer all day can be as unhappy and unproductive as one stuck in a corner with a box of flashcards. The computer will be at its most useful, educationally, if it is used as an imaginative tool, in conjunction with other educational tools and techniques which have demonstrated their ability to promote learning.

Educators like Papert would likely be horrified at the thought of using computers for education in a random, unplanned, uncoordinated fashion. Simply dropping computers in classrooms, with little preparation or consideration for their impact, makes it possible for the machines to be poorly used, or even abused. For girls and women, students or teachers, the potential for abuse is greater, because the new problems that come with computers may well be compounded by the old problems that already haunt the education system (i.e., sex stereotyping in teaching roles and assignments and in course options for girls and boys).

Girls, mothers, women, and teachers can, if they are aware of the potential pitfalls, work locally to ensure that computerization in education does not serve to disadvantage individuals (suggestions for strategies appear later in this book). The following tendencies, already observable in the educational use of computers, make it clear that action and concern on the part of individuals must be met with equal commitment from school boards and other elected officials with educational responsibilities.

You're Not So Hot in Math, Are You?

Sheila Tobias has, in an excellent book, already clarified why girls and women have, historically, done poorly in math and science.[4] The harmful myth that women and girls just "can't do math" has permeated our school system, our society, and, most damaging of all, our own perceptions of ourselves. It has contributed significantly to women's own curtailment of their choices.

To this first myth is being added a new and equally pernicious one: you have to be good at math to use computers. The resulting equation will, if it is accepted, continue to play a major role in denying girls and women a fair share in the positive aspects of computerization.

Girls and women "can't do math"	+	You have to be good at math to use computers	=	No point trying to teach girls and women about computers

Already, in some high schools, the equation is firmly in place. Students who want to take computer science courses must have completed certain math prerequisites before they can begin learning about computers. Girls are less likely to have those math prerequisites because the expectation is entrenched that they will not do very well at math.[5]

The second part of the equation, that you have to be good at math to use computers, is a misleading generalization. There are indeed a small number of computer occupations where a solid math background is invaluable. However, the most important aptitudes and skills needed for working with computers are logical thinking, problem-solving ability, organization of thought and time, and patience and determination. Many women and girls have these skills and abilities in abundance.

Nevertheless, in most schools, computers are largely viewed as male turf. Girls and women teachers, if they want to have an equal share of computer time, often must make an issue of access to the machines and computer courses.

You're Not Mechanical

The computer is a machine. If it lives up to its promotion, it is an important machine. Girls and women are still struggling with the perception (held by themselves and by society in general) that important machines are a male preserve.

Added to this impression, there is the problem of computer jargon — a largely male-created, male-oriented idiom. The following example may help to explain why girls and women have the feeling they are not mechanical enough to operate computers.

> Connect the twin lead output cable of the antenna switchbox to the VHF antenna terminals of your TV set. If your set is one of the newer types with a round 75-ohm VHF connector, you will need a 300-ohm to 75-ohm converter (not supplied) to connect the switchbox to the 75-ohm VHF antenna input on the set.

This instruction, taken from the user's manual of a well-known personal computer, attempts to describe how to connect the computer to a television set (a task which is, in fact, very simple).

Ironically, manufacturers have taken pains in designing micro-computers so that very little mechanical knowledge is needed by users. The initial impression remains, however, that without some knowledge of electricity or electronics, the novice computer user will be unable to figure out how to use the machine, or will break something.

In school classrooms, girls and women teachers, feeling they are not "mechanical", are inclined to hang back, and let the boys and men teachers (who give the impression that they know about these things) use the computers. The boys and men rush in to fill the void, confident in their ability to operate machines. The machines, obedient and willing servants, don't care who runs them.

Just Type What I Tell You

The one area in which girls and women are usually superior to men in computer operation, right from the start, is in typing skills (known as "keyboarding" when men and boys do it). Girls and women, even those who have never had typing training, usually have had some earlier, informal experience pecking their way around the keyboard.

In computer courses for both adolescents and adults, this useful skill for computer work often serves to disadvantage women and girls. Their ability to type does not move them to the head of the class. Instead, they often take on (or have imposed on them) the role of passive inputters of data. The men/boys do the planning and contrive the projects, while the women/girls sit at the keyboard to do the drudge work of typing the instructions into the computer.

"Keyboarding" is not computing; sitting and typing, even on a computer keyboard, is still typing. Real understanding of the machine and its capabilities come through experimenting, trying out concepts, and devising one's own computer projects. The ability to type (or at least knowledge of how typing is done) which many women and girls bring to the computer is a skill that should be used for their **own** learning and accomplishments.

Word Processing is the Computer Course For You — Or Is It?
The one type of computer course which **IS** seen as appropriate for girls and women is word processing. In high schools and community colleges, there is a strong tendency for boys/men to take electronics, computer science, and engineering. Girls/women take word processing.

Most word processing courses emphasize the traditional secretarial-clerical skills of speed and accuracy in typing. Additional new skills, such as editing, are taught as well, but what is conspicuously absent from such courses is instruction in how the machine works and why it operates as it does.

As mentioned previously, word processing computers are often "dedicated" — that is, they are specialized machines which will do no other computerized task other than word processing. Thus, learning to use them can consist of learning a set of commands (which are not transferable to any other computer application) to operate the computer by rote.

For example, the person operating the word processing machine might be instructed to press a key labelled "SAVE" at the end of every page of work done, without being given any explanation of why the action is necessary or what is accomplished by doing it. A full explanation of "SAVE" should include information about the computer's temporary memory (RAM), instruction about how information can be stored on disks or magnetic tape, and a discussion about the need to protect valuable information

against power failure or computer malfunction. Without this background, "SAVE" becomes a meaningless key to be pressed only because one has been told to do so.

Most word processing courses do not teach people to use computers so that they will understand the machines' potential uses in their own lives. They teach people how to use one type of computer in a very specialized way so that a service can be provided in the workplace.

Word processing courses do not make women and girls into creative and independent computer users. They are merely an extension of the old "commercial" course ghettoes that have steered women into secretarial and clerical occupations.

What the Teacher Teaches

By far the most difficult problem to define and deal with in the area of computers and education is the role of teachers. In high schools, colleges, and universities, a subtle but powerful message is communicated in the fact that computers are still very much the preserve of math and science teachers, and that math and science teachers are, in the majority, men. Women teachers, in the main, do not have technical or scientific backgrounds and many of them teach subjects which have received little attention in the development of educational computers and software.

What students in these educational institutions see, as a result, is that computers are mainly used for teaching math and science and that the teachers who usually use computers are primarily men — hardly a situation to encourage young girls to do something that would necessarily make them seem "different".

Arguments that this situation "just happened", that it is not intentional, are irrelevant to the concern about its effect on students. Only a very active process of involving the whole school or college and all its staff in using computers and in developing appropriate software programs will counteract the image which exists. The process can only be accomplished through excellent professional development programs for the teachers and through policies which give all staff a vested interest in eliminating the stereotypes which, in the end, damage everyone.

For Further Thought/Action

There are really two kinds of computer education at present:

- education **about** computers: so-called "computer literacy"

education, which teaches how computers work and what their uses are; and

- education **using** computers: in which computers are used as tools to help in teaching many different educational concepts.

Our education system is not currently providing consistent or coherent learning opportunities in either of these areas. Women teachers and girls are, at present, likely to be left out of many computer learning opportunities and to get the impression that computers are not for them.

One of the main justifications, then, for buying a home computer (either cooperatively with a group, or individually) could very well be to allow girls and women to learn about computers and to learn while using them. There is a problem, however, in that good, flexible personal home computers are relatively expensive. The ability or inability to buy one can increase the existent inequities in our educational system (richer kids have computers or go to computer camps, poorer kids — both girls and boys — get left behind).

Thus, buying a computer for educational purposes gives some children the advantage, while leaving others to fend for themselves. Even if it may operate that way at times, our educational system is not based on the principle that family income determines the quality of children's education, nor on the assumption that girls and women have to take extraordinary measures to get equal learning. However, these conditions do exist to a recognizable degree, especially in educational "extras" like after-school lessons, specialty camps, enriching travel, etc.

The solution does not lie in simply pressuring governments and school boards to buy more computers; more computers used the same way will do little to eliminate the biases in attitudes about how computers are used and the inequities in who gets to use them.

What is needed, to begin with, is some serious questioning and observation of the computer phenomenon by educators, parents, and students, leading ultimately to the development of clearly defined objectives and learning activities which are accessible and applicable to all students. The educational computer's most enthusiastic supporters could have no objection to such a process. Women and girls should find anything else unacceptable.

Women's Health and the New Technology

While women grapple with all the other issues surrounding the microtechnology revolution, there is yet another aspect of microtechnological use that requires attention — the possible effects of VDTs on health. Most of us have read or heard reports about concerns that are surfacing over the health hazards associated with computers, particularly computers in the workplace.

Employers, manufacturers, and government health organizations release studies which reassure us. Labour organizations respond with alternate studies which frighten us. Researchers contradict each other. The complexity of the issue can make it very difficult to decide at this time whether we should proceed confidently or cautiously. Strong positions are held for each approach.

Sorting Out the Issues

Whatever the conclusions that may eventually be reached on the hazards of working closely with certain microtechnological equipment, women have the right to concern themselves with the health effects of the new technology. In the absence of a straightforward appraisal of the situation, it is reasonable for us to take steps to protect our own health and safety. The automation of the workplace will put increasing numbers of women in direct contact with the new technology, and in addition to the general health concerns of all workers, women have to consider the possible effects on themselves.

About Rays

One area of major concern is the emission of radiation from VDTs. Increasing numbers of workers go to work each day to spend hours in front of computer monitors which are really specialized television sets. Clerical workers, airline personnel, and travel agents are among those who already use VDTs extensively in their jobs; soon, workers in many fields will find themselves spending larger parts of the day in front of the screen.

Women may continue to form the majority of VDT operators, and thus, this aspect of microtechnology will have an effect on more women than men. At present, the focus is on the following areas of health concern related to radiation.

Eyesight: VDT operators report soreness, burning, dryness, and irritation of the eyes. These may be symptoms of eye-strain resulting from several factors associated with VDTs: glare con-

trast, flicker effect, the size of the screen, and the letters or numbers it displays. More seriously, there is conflicting evidence about whether cataracts and deterioration of the cornea might result from long-term exposure to the microwave radiation emitted by VDTs.

Some work is being done on developing devices to protect workers' eyes or to reduce strain on them. There is concern, however, that the safety standards which govern radiation emissions are inadequate, based as they are on guidelines developed for television sets. These standards were not developed to protect VDT operators who spend many hours a day sitting much closer to their terminals than most people watching television.

Psychological Effects (stress): Research indicates that working at a VDT can be a major source of physical and psychological on-the-job stress. For clerical workers especially, high levels of stress are likely to result because:

- their work stations may be poorly designed (if "designed" at all) with uncomfortable chairs, poorly placed keyboards or screens, inadequate ventilation or temperature control;
- operators require a high level of concentration;
- they may have to work a full eight-hour day, if not more at times, in front of the screen, with few breaks;
- they must memorize machine commands and be able to interpret the problem if particular commands don't work;
- the computer is set to pace the work and can monitor the speed and accuracy of the operator, thus facilitating management pressure for continual speed-up of the work pace;
- insufficient training can result in frustration;
- other employees or employers may have unrealistic expectations about the speed and ease with which work can be done "by the computer".

As well, many VDT operators do boring work for poor wages, and they see their jobs as being unimaginative and out of their control. In some organizations, no effort is made to allow each worker a variety of tasks during the working day. The employer or supervisors may have no interest in encouraging people to acquire new skills or to expand the scope of their jobs. Workers who spend all or most of the working day typing information into the computer complain that they are regarded as machine-like themselves, rather than as intelligent, individual human beings.

Effects on Reproduction and the Reproductive System: Scientific evidence is incomplete on the question of a link between exposure to the machines and reproductive problems in women. There have been a number of reports of possible birth defects associated with pregnant women operating VDTs. As well, there is some evidence that the risk of spontaneous miscarriage is increased in women who work in front of screens. Exposure to radiation may even result in a decrease in fertility. Yet it remains difficult to be sure that there is a direct causal link between the VDTs and these misfortunes.

An Unsafe Future?

There is, however, enough evidence of a disquieting nature to make women's concerns about the health effects of working with computers very legitimate. At one time the office seemed a safer place to work than the factory. However, the new technology may mean that the hazards of office work are equally serious, but not as obvious. It may take many years (as it did with certain mining and factory occupations) for the hazards that may result from long-term exposure to VDT radiation to become evident.

Clarification of the situation and useful decisions will come about if women, as individuals and as a group, insist that:

- up-to-date information and the results of new studies are easily accessible and freely available to anyone with concerns;
- questions about the health effects of microtechnology are not neglected because they are too expensive to answer or because unfavourable answers would be too expensive to deal with;
- employers take reasonable steps to protect workers' health, in the absence of conclusive answers about the ramifications of working with the new technology;
- special emphasis be given to the exploration of health concerns for women, especially those involving fertility, pregnancy, and the reproductive system. This would include effects on men who are around VDTs, because if their reproductive systems are altered, it should be known if there was a link to women's reproductive health.[6]

At present, employers, manufacturers, and governments appear interested in pressing ahead with automation as quickly as possible. Women's groups and labour organizations must focus on the issue of the human costs of inadequately planned adoption of microtechnology in general, and computers in particular.

Revolutionizing Play

A large part of the attraction of the microcomputer, for individuals especially, is its ability to add fun, creativity, and excitement to our lives. The machine that allows people to do word processing, electronic spreadsheeting, information storage retrieval, and processing analysis offers, at the same time, a banquet of delight for the playful, inventive side of human beings.

Just for Fun?

The big excitement, especially for the younger set, usually begins with computer games. Filled with colour, motion, sound, and action, software game packages (in disk, cartridge or cassette tape form) can have the player flying through space in the driver's seat, whizzing down a hill on an obstacle-filled ski course, or playing tennis with a Wimbledon-class opponent. In quieter moments, the computer is always ready to play chess, backgammon, concentration, etc., and to lose, occasionally, with good grace and humour.

As with other games invented by humans, the result of such playing is not always simply entertainment; often a good deal is learned in the process. Good computer games encourage:

- **Logical Thinking:** outwitting the computer in strategy is not always easy, but it is usually possible. Planning, memorizing, and organizing ideas are skills which can be developed through game-playing;
- **Reading:** games often have written instructions or information which appear on screen. Reluctant readers start reading without even noticing what they are doing;
- **Computation Skills:** many games have associated numerical information. Players learn to calculate these figures because it increases the chance of winning;
- **Eye-Hand Coordination:** games which require players to manipulate "joysticks" to move around the screen encourage coordination and teach or reinforce concepts like left right, up down, and so on;
- **Computer Literacy:** when the reward is fun and games, the most timid novice finds it hard to resist touching the keyboard, operating disk drives, using joysticks, and giving the computer elementary commands.

In addition, the computer's entertaining characteristics can be deliberately combined with more traditional educational concepts

to entice students to learn while they play. As with most computer games, educational games often have several levels of difficulty, allowing the learner to start at an appropriate level and advance when a new challenge is needed.

It Isn't All Laughs

The most troubling aspects of computer games are their cost and their often violent nature.

Games can be quite expensive. They are, underneath all the fun, computer software which has been designed, programmed, tested, revised, and marketed. Hundreds, even thousands, of hours have gone into their development, and unless the volume of sales increases greatly, they will always be costly relative to other forms of home entertainment.

In addition, games, like home computers, are marketed aggressively. We can expect there will always be another new game to be bought which is said to be better than its predecessor. There is also concern about the way in which computer games are being marketed through children's television programming; watching cartoons about a computer game character on Saturday morning television surely inclines a child to want a computer and the game which features that same character.

To all these questions must be added that of whether the social gaps between the rich and poor will be increased in another form by the different access poorer and richer children have to this form of recreation.

In the Video Arcades — A Special Case, or the Same Old Thing?

The wealth of games developed for computerized playing is such that few computer owners could afford to own even a fraction of them. Moreover, the majority of committed games-players are young, and do not have the financial resources to buy new games or even computer hardware to play them on. Yet, especially for the young (really, the young **man**), computers are "hot stuff" and playing computer games is prestigious. Where do you go when you have a pocket full of quarters and a hunger to hang around with your buddies taking part in **THE** most socially acceptable activity of all? You go to the video arcade.

The Place to Go

The video arcades have the aura of the pool halls and the pinball emporia of earlier decades. They are the preserve of the young, particularly of young men and boys, who have a few dollars to spend and time on their hands. While arcades are open to everyone, the people who frequent arcades are predominantly young and male.

The main activity is, of course, playing (and watching others play) computer games. These games can be clever and visually attractive but they can also be violent and sexist. A vast majority of them involve shooting, bombing, destroying or eating up a fictional enemy. Such games may be an incitement to warlike, ferocious behaviour. In addition to promoting brutality, they often have insidious or blatant sexist overtones and reinforce stereotypical images of male and female behaviour. Female game characters in these packages are portrayed as passive, helpless victims who often must be saved by a heroic male character. More pernicious are the games whose objective is for the player to humiliate or destroy the female character.[7]

On the one hand, video arcades offer the opportunity for people (for men and boys, at least) who don't own computers or have easy access to them to participate in the microtechnology phenomenon. For the price of a quarter, the arcade visitor can use a specialized type of computer and see what the magic machine is all about. As well, the video games can have an educational element.

For women and girls, however, video arcades have little to offer and much to answer for.

Exclusion and Exploitation

A girl or woman who walks into an arcade is an oddity. The newest of the male hangouts has all the characteristics of the old familiar men-only establishments.

As well, the girl or woman playing video games has to contend with stereotypical images which, either subtly or overtly, portray her sex as helpless, needy, and passive. It is rare indeed for the main character in a video game to be a female, or for any female character to be powerful and active. Even in games where the main character is the player (an androgynous "you", as in for example: "You are the Commander of the USS Enterprise . . ."), the activities and assumptions of the game may not reflect the

priorities or interests of most girls and women. In space games, for example, the objectives will almost always be to conquer new planets, to defeat alien enemies or to accumulate wealth and power.

What to Do?

The ramifications of the video arcade scene are at once obvious and troubling. As with other "for-men-only" activities, the result of such segregation is difficult to quantify or even to identify, but questions must be raised:

- Will the camaraderie developed among boys in the video arcades add to the "us guys have got to stick together" attitudes that later disadvantage women?
- Are the computer skills developed in the arcades, skills which most girls are not developing, significant enough to increase the advantage of men over women in the area of computer expertise?
- What is the effect on girls' perceptions of being unwelcome, excluded, different?
- What can be done about violent and sexist games that promote unacceptable attitudes?
- What is the effect on both boys and girls of seeing so clearly that there are bodies of knowledge and types of activities that are, for all practical purposes, more open to males?

The phenomenon of the video arcades is probably of most concern because it highlights the degree to which our society sets up and maintains situations which institutionalize the segregation and exclusion of groups, such as one gender group from another and the young from the old. It underlines the fact that whatever progress has been made in the past two decades toward equality between the sexes, in real and tangible ways girls and women are still on the outside looking in. Even if there are some aspects of arcades that are detrimental to females and males (of any age), it demonstrates clearly that attitudes, the hardest of all things to change, may travel pretty much intact from generation to generation.

The good and valuable aspects of computer games are worth celebrating; any medium which can offer entertainment, education, and skill development simultaneously is worth at least some of our attention. Violent, sexist or otherwise offensive computer games must be strongly discouraged and parents should guide their buying accordingly. The intelligence which created the machine itself can surely be prodded to do better.

If You Can't Draw a Circle

Visual artists are discovering the computer, and with good reason: it is an exciting new medium for creation. The most sophisticated machines open up possibilities for three-dimensional images, movement, subtle modification, and image development in a single work of visual art. Even many simple home computers are surprisingly versatile in what they allow users to create on screen.

Women and girls have a new art medium in front of them, one which does not have a history of thousands of years of male ascendancy to intimidate and invite comparison. The field is as new as the technology; the techniques are in the developmental stages.

Can't Carry a Tune?

As with the visual arts, the microcomputer offers new creative possibilities for people interested in making music and in exploring the potential of sounds which are new to the human ear.

There are simple, medium-priced home computers which can offer the following musical attributes: five octave range; three "voices" simultaneously; five different tone quality choices for every musical sound; and the option to play music on the computer's keyboard, or to program it and save it on disk or cassette tape. Some home computers can even be hooked up to the user's sound system to improve sound quality.

Professional musicians are already using the new music in their compositions; the most avant-garde are incorporating computer techniques in surprising ways. As in the visual arts, the field is so new that our prior assumptions about what and who makes music may have little bearing on creative possibilities.

All in All

There is good reason to be excited about the graphics, music, and entertainment potential of the microcomputer. For many users, especially young ones, these applications will be the most attractive (and probably the first) uses to which home computers are put.

It is conceivable, given the flexibility and remarkable possibilities of these machines, that many users will go on from the game-playing stage to develop their own unique uses. Playing games

leads to questions about how games are made, and then, perhaps, to the desire to invent a new game. An interest in programming the computer can follow, opening the way to the development of individual experiments for making the computer one's **OWN** machine.

Ironically, many of the microcomputer's detractors dismiss it as an expensive toy precisely **because** of its capacity for fun and games. In the short run, however, these are the qualities of the machine which may make it accessible and attractive to many people. What begins as game-playing, moreover, can well develop into real understanding and creative exploitation of a medium which has much more to offer than mindless "shoot-em-up" nonsense.

Electronic Invasion of Privacy

Information is power, and the computer is, above all else, an information machine. With its ability to store, process, analyse, and manipulate vast amounts of data at incredible speed, the machine has irrevocably changed how we human beings can obtain and use information. Women have to make sure they are involved in the control of information in the microtechnological society if they want to have a fair share in the power of that society.

Information is rapidly becoming more centralized as a greater proportion of our society's processes are computerized. Data which used to be stored in filing cabinets and laboriously searched through by hand is now stored on disks or magnetic tape and searched through by computer programs. Information transfer, which used to involve finding, copying, and mailing documents from one office to another, or to an outside person, or vice versa, now can involve a quick computer search with the transfer of information being accomplished through computer-to-computer telephone links.

The new technology has vastly greater capacity for storing and handling information about people in our society. The types of information involved fall into two broad general categories:

- Personal information: consists of records about individuals, and can come from a wide variety of sources. Individual data can be found in records like birth certificates, employment files, vehicle and driver's licences, social insurance records, medical records, and so on. Police forces and the RCMP main-

tain police and intelligence records; financial records, including bank accounts, credit cards, loans, mortages, etc., are kept on most adult Canadians.

- Data is also collected on groups of people where an overall picture is of interest: for example, market surveys, the national census, political and attitudinal polls, and so on.

More data is being gathered about people, both individually and collectively, than ever before. It is cheap and practical for even small organizations to acquire a computer and to process information about people. The same technology can be used to gain access to other organizations' information (usually with their permission) merely by flicking on a switch and dialing a phone number. Such data can be matched, cross-referenced, collated, and integrated with other information with very little extra cost or effort.

Information about people has become a valuable, saleable commodity. Mailing lists are bought or rented to anyone with a product to pitch, funds to raise or an interest to promote. As a result, acquiring or using one type of credit card will usually bring a mailed invitation to obtain another one. Stores, banks, credit card companies, and so on, routinely keep track of the buying patterns and credit habits of their clients.

When the possibilities for use of all the various types of information about individuals are considered, the issue of individual privacy becomes much clearer. Even people who have led completely circumspect lives have had details of their activities and "biography", which they would want **only** the original collecting source to know about, gathered on them without their permission and knowledge. The possibility and likelihood of that information being shared, without the subject's knowledge, by anonymous computers under the direction of unknown hands is unacceptable.

Comprehensive or aggregate information about groups, because it is more anonymous, may seem of less concern. However, although it may not threaten individuals, it is equally open to abuse. For example, in recent years we have seen the increasing power of opinion polls in swaying political and attitudinal views. The nightly news announces, for example, that a poll has revealed that women feel they are being treated more fairly in the workplace; the poll quickly translates itself into a "fact" that women are getting an even break, even if the questionnaire

was poorly designed, administered or interpreted. We can't be certain, but the impression of its factualness remains.

Privacy Principles

Many of us are not aware of the extent to which our lives are documented and on computer files. However, having the facts of one's private social and economic life monitored and recorded can cause people to be vulnerable to abuse of privacy. Thus, serious consideration must be given to developing ethical and legal standards that will protect the legitimate privacy of individuals and groups.

In an issue of the CUPE bulletin **The Facts**, author Marc Bélanger discussed some of the standards that should be set for the proper establishment, maintenance, and closure of data banks.

To protect personal privacy, he suggested:

> Data banks that hold personal data should be licensed and required to declare: the purposes of the bank, how long it needs to exist, the absolute minimum it needs to meet its purposes, the categories and numbers of persons about whom the data would be held, the sources of the data, the periods of time it would be necessary to hold each piece of data, and which items could be held in ways that avoid linking them with identified or traceable individuals.[8]

Further, he states that there are other principles that should be observed in order to protect the privacy of those about whom data are collected. He includes principles such as:

- Only authorized people should be allowed access to stored information and only for the reasons declared when the information was collected;
- Each piece of data should have a time limit for its storage attached to it;
- Subjective data — data involving value judgements — should be marked and handled carefully;
- No more information than is absolutely necessary for the declared purposes should be collected;
- A person should have the right to inspect their records and correct any errors;
- If administrative data on a person is wanted for research purposes, people should have the right to know the purpose

of the research and if they legally have to supply any data at all;

- In statistical systems, the identities of data subjects should be kept separate from the rest of their data.[9]

Of course, any principles would have to be transformed into regulations that could be enforced, if our privacy is to be truly protected.

Bélanger's list is not only an excellent guide, it is also instructive because it recognizes that the great amount of data being accumulated about individuals and groups is a trend which will certainly increase as the technology proliferates.

The Wealth of Information

Quite correctly, then, there is concern about the potential for misuse of the computer in the storage and manipulation of information about people. As with so many other aspects of the new technology, however, there is another side to this capability.

The technology of data processing — collecting, storing, analysing — is more affordable now than ever before. Ten years ago, only large organizations could afford computers; as a result, only large organizations could have access to or create computerized information. Inexpensive microcomputers open up the possibility for different kinds of information users and information providers to participate in the data exchange.

In general, women and women's groups have been "information poor". Cut off from the upper echelons in government, corporations, and institutions, women have also been cut off from the information which is available to those at the top of any organization. Not having good information makes it difficult to advance arguments for change, to correct misinformation, to have an impact on decision making, and to present alternative viewpoints.

To some extent, the new technology equalizes access to information. Much of what we need to know is not "top secret" or classified; it is simply too bulky or difficult to use without a computer. For example, an individual woman who wanted to examine her employer's record regarding promotion of women to management positions would have a difficult time collating and tracking the career paths of even 30 female employees over a period of ten years. A small microcomputer would make such a task relatively simple.

Such a woman, doing her own small study, could become an information provider, as well as an information user: the results of her survey could be shared with her employer or her fellow employees to support a request for a more equitable promotion policy.

As individual women, and as members of a larger group, we cannot allow ourselves to be "information poor" while others around us are "information rich", especially when we are the subject of much of the data. Using information well, and providing good information where it is useful, can make women active participants in the ongoing shaping of society.

Of course, it must be borne in mind that simply **having** information is not enough to completely control or change one's world. Power must be acquired to **use** the results of that information for desired ends. Women as a group do not have full political, social, or economic power in our society and no amount of information **per se** will change that. However, having access to information about ourselves and having the ability to control it is an essential step in the right direction.

Women, Computers, and the World

There is no doubt that microtechnology will have a direct, visible impact on women's lives in many ways. Previous sections of this book have explored some of the applications of the computer which have already begun to affect women — positively, negatively, or most perplexing of all, with mixed results.

The computers that women will be dealing with in all the areas previously explored will be the machines we can expect to see in workplaces, schools, homes, and so on. However, the most rapid and significant advances in microtechnology are taking place in fields which are, for the most part, invisible to the majority of people. Ironically, these developments have the potential to change human life in the most profound ways of all, and women's lives more than men's.

The scale and the possible effects of the computer applications outlined in this section are vast and frightening; even thinking about them can leave the most vigorous and active person feeling pessimistic, hopeless, and helpless. Such massive concerns go beyond what any individual can conceive of or cope with. Effective responses can, however, be generated, acted upon, and sustained

by large groups of individuals who share common views about how human-invented tools, like the computer, should be used.

The proliferation of computers in the immediate and visible arenas of our lives is nothing compared with the computerization of the war industry. The applications of microelectronics for military purposes are practically limitless:

- weapons systems, such as guided missiles;
- computer control and support of conventional weapons;
- satellites for military and intelligence use;
- computerized war "games" for training and strategizing;
- biotechnology (new health techniques and equipment) for improved health and disease resistance in fighting forces;
- office automation for administering and directing activities.

Although the computer manufacturing community spends some of its time developing appealing machines for the general populace, it spends vastly more in developing microtechnology for military use. As well, researchers and manufacturers are under constant pressure to gear even more of their research and development efforts to the production of military hardware and software.[10]

Women are not part of the inner circle of the military complex. Our concerns and issues have little influence on the decisions made or the directions taken. We are not the only constituency lacking sufficient representation, of course, but we are certainly the largest.

No one will ask women if they approve of the increasing use of microtechnology in the military arena. Yet the use of military technology may change the lives of women and of all human beings so as to make futile any further discussion or speculation about job loss, video arcade sexism, health risks, or whatever.

The Third World

In the world economy, the rich get richer and the poor get poorer. The Third World, already a source for the industrialized countries of human and natural resources, is ripe for still more exploitation in the microtechnology age.

The Third World simply does not have the tools or the expertise to compete with industrialized nations, and the gap between

the more developed nations of the northern hemisphere and the less developed of the Far East or southern hemisphere will increase as a result. The consequence will be increasing exclusion from the small group of countries which determines the way the world will be run.

Computer manufacturers are increasingly looking to Third World countries as desirable locations for microtechnology assembly plants. The wages in such countries are much lower and employee working conditions are much less regulated; the pressure of the computer marketplace makes these production decisions advantageous for the computer manufacturers. Such decisions will provide fuel for the microelectronic revolution which will benefit the developed countries.

In addition, as we move more and more towards an information-based economy in the North, the developing countries will be increasingly disadvantaged. Much of the world economy will depend on the capacity to acquire and use information; those countries which cannot afford to be involved will find their access to information cut off.

What we can foresee from all this is the continuation and the magnification of a situation which, especially for Third World women, is already intolerable. Women are the poorest, most exploited, and least free segment of the population in large parts of the world. As the gap between rich and poor widens, the possibility of any improvement in their situation becomes even more remote.

Is There Hope for the Future?

The implications of microtechnology explored in this section are vast and overwhelming in their implications. For individuals, they conjure up a vision of the future which appears terrifying and hopeless. What can one person do?

If we operate as individuals, and consider these issues only by ourselves, we will find it really impossible to avoid becoming passive and unable to act. The scale of the problems is too massive to conceive of any individual action which will make a significant difference.

Yet if passivity becomes the norm and hopelessness prevails, the power to affect the direction of the future is left with those who already have it and who resist relinquishing it, or sharing it in

new humane ways. Will we find their vision of the world acceptable?

In the past, group actions have become powerful forces in determining the outcome of events. Group actions have influenced the courses of wars and stopped the building of freeways; they have brought to the forefront concern about human rights and environmental issues. They have allowed individuals the option to participate actively in situations where it first seemed that one person could do nothing that would make a difference.

The concerns raised in this section about war implements of the future, and the effects of microtechnology on the Third World, are too serious to be ignored. The consequences of allowing such development to go unscrutinized and uncontrolled (except by those who have a vested interest) will rest heavily on human beings, and on women in particular.

If these concerns seem overwhelming, it is because their scope is just too big for individuals. If we feel like grains of sand in comparison to the trends and directions which confront us, the solution will surely only come in recognizing that we are most effective when we unite and act as a group.

Possible Actions for Individuals and Groups

In what are still the early days of the computer era, trying to learn about the new technology and finding ways to have a voice in the issues it presents is, ironically, a far more difficult task than actually using a computer. The young often have the advantage (perhaps appropriately) with computers appearing in schools and classrooms.

For adults, it seems, the opportunities for practical experience and discussion about computer applications are not so readily available. Women are especially disadvantaged: those who work at home likely do not have any access to a computer, whereas those who work outside the home use computers, if at all, for tasks like file searching or word processing, with little or no explanation even of how the technology works or what other uses it might have.

There are alternatives, however, to the random secondhand learning that comes through listening in to others' conversations about computers and reading whatever articles you can lay your hands on through chance.

The following pages suggest strategies for individual women and for groups who want to start learning how to make the computer **THEIR** tool as well. By groups it is meant here the social or service-oriented organizations women may belong to, whatever the purpose of the group, but which, because of having a concentration of people can provide an opportunity for a pooling of interests and skills. The topics covered include matters that affect self-development, families, employment, and the concerns of women in general. Although there are costs associated with some of these suggestions, many of the options listed here require only resources available in most communities.

If you are curious about this pre-eminent tool of our age — if you want to bring its benefits to you, your family, your job or your organization, and at the same time get ready to deal with some of the potential disadvantages of the computer and other new technologies — the following strategies may prove helpful.

Learning About the New Technologies

Activities for Individuals

1) To get started, select your favourite medium (television, books, magazines, etc.) and see what is available to help you understand and keep up with microtechnology.

Resources

- Science or business section of your local newspaper.
- Bibliography at the back of this book.
- Your local public library for books, magazines, films, videotapes, etc.

Activities for Groups

1) Invite speakers to meetings, workshops, and conferences. Women who are currently working with the new technology are often only too happy to share their knowledge and experience.

Resources

- Medium- and large-sized companies have already computerized their operations to some extent. Call and see if they have someone who would be willing to speak. Trade unions have devoted much thought and research to these issues and can provide speakers and/or publications.
- Boards of education, colleges, and universities often see such speaking engagements as part of their mandate for community education.
- Work cooperatively with other women's groups in your community to put on a conference or series of workshops about the new technology.

Activities for Individuals

2) Begin or increase your personal experience with computers.

Resources

- Use the appendices at the end of this chapter to find out your personal priorities.
- If possible, visit a computer store during a "slow" time and ask to see an introductory package. Ask the salesperson to let you try the machine yourself.
- Arrange a skills exchange with a friend who has a personal computer.
- If there are computers where you work, develop strategies so YOU can get your hands on one.
- Take the opportunity to ask bank tellers, travel agents, librarians (anyone who uses a computer on the job) to tell you what the machine does for them and how they use it.

Activities for Groups

2) Make learning about the new technology one of your group or organizational priorities.

Strategies

- Survey your membership to find out how many people are feeling left out and behind in the technology rat race.
- Set up a working group that will make ongoing membership education happen.

Activities for Individuals

3) Take computer courses.

Resources

- Women's Studies departments may offer courses that are specifically for women. Look for courses that are an introduction to computers with hands-on experience.
- Boards of education may offer basic introductory courses or an introductory course in programming in the computer language BASIC or LOGO. Take it.
- Community colleges or universities might have an introductory course that will suit your needs.
- From time to time, there are free classes that are available to purchasers of computers. These may be too short or fast; but at least they are worth a try.
- Whatever course you take, part of your time in class should be spent on the computer. Without this real experience using the computer, the course is of minimal value to you.

Activities for Groups

3) Arrange training sessions and workshops that meet the needs identified in the survey.

Resources

- Contact established private and public organizations that offer computer literacy training and see if your group can get a discount.
- Community centres and libraries have begun to respond to public and group requests for this type of activity. Explore the possibilities in your community.
- Government funding may be available to subsidize training for non-profit groups.
- Scan your own membership and see what skills exist. Contact other women's groups to see if they have additional resources.
- Enlist the help of local politicians and community and business leaders in your efforts to establish educational workshops for your group.

Activities for Individuals

4) Buy a computer (they start at under $100).

Resources

- There are books, magazine articles, consumer magazine articles, and news articles on the subject.
- There are courses on "how to buy".
- Follow the "If You're Thinking of Buying a Computer" section on pages 93-94.
- If you can't afford a computer by yourself, buy cooperatively with friends.

Activities for Groups

4) Buy a computer.

Resources

- Generate a list of how your organization can use its computer to improve the group's effectiveness. This list will also act as the learning plan for your membership's computer literacy.
- Look for freebies, donations and grants.
- Buy a computer cooperatively with other organizations.

Career Planning, Education, and Training

Activities for Individuals

1) Seek training in computer applications and information processing as they apply to your job/career.

Resources

- Training options exist and many employers are willing to pay for them.
- Call the nearest training or education centre which prepares people for your job/field. Inquire about current course offerings which involve using computers.
- Find out who in your organization is using a computer on the job. Chances are that person is a real enthusiast who would be only too happy to share information and techniques with you during coffee breaks, lunch hour, or after working hours.
- Consider taking a programming course; it will likely be more useful as background information than as a new skill, but it will also put you in a better position to hire or direct programmers if necessary.
- Be your own resource: be ingenious in figuring out how you can take that course or courses. It is very important to your future job prospects that you be one of the first, not one of the last, to make contact with computers in your field.

Activities for Groups

1) Make your group a forum for discussing the career and job implications of the new technology on women.

Resources

- Invite guest speakers from the electronics community for a series of lectures on career opportunities in the new technology.
- Visit a high tech firm and spend the day talking to employees, particularly female ones, and find out what they do, and how they see their careers are moving.
- Invite a personnel director to discuss the job descriptions and qualifications of high tech jobs.

Activities for Individuals

2) Anticipate the information needs potential of your job or career.

Recources

- Check with professional, trade or craft associations for publications, courses, lectures, workshops.
- Look creatively at your job to discover ways in which the computer could be a useful tool. Be prepared to suggest how you will use a computer rather than having someone else make the decision for you.
- Try to get to know other people with similar jobs and careers to find out what they are doing with computers. Local women's organizations might be a good source of such contacts.

Activities for Groups

2) Survey the computer literacy needs of your group and fulfil those needs.

Resources

- Contact your local community college to see if courses could be created to meet the needs of your members.
- Seek funding from your national organization or provincial funding for education and set up your own course.
- Find a private consultant who would set up a course for your members; perhaps a computer literacy weekend.

Activities for Individuals

3) Investigate the possibilities for retraining into high-demand occupations.

Resources

- The Canada Employment and Immigration Commission (CEIC) offers some retraining courses of interest to women, and others specifically directed to women's needs. Those of particular interest may be:

W.I.T.T. — Women in Trades and Techniques
W.I.N.T.O. — Women's Introduction to Non-Traditional Occupations.

- Private educational organizations offer many courses. Grants or funding assistance from governments may be available to you.
- Sign up for any on-the-job training courses or professional development activities that are open to you.

Activities for Groups

3) Create a listing of all high tech retraining opportunities that are available.

Resources

- Write letters to CEIC for a complete listing of all their courses. Try to establish a procedure that will allow women to have access to these courses.
- In a similar manner, have local community colleges and universities list their options and procedures for admission.
- Gather brochures from private educational organizations and consultants to list what these organizations can offer.
- Inquire about provincial scholarships to subsidize your members who wish to take courses.

Activities for Individuals

4) Take stock of your strengths and identify the areas you'd like to develop.

Resources

■ Recognize that women often have special and superior skills in the following computer-oriented areas:

problem solving
trouble shooting
decision making
logical planning.

Ironically, even the typing and filing skills that have long locked women into specific job ghettoes are suddenly at a premium.

■ Most on-the-job computer applications require a knowledge of the keyboard and the ability to organize computer files in a logical way. If you don't know how to type, now is the time to learn and to encourage your daughter to learn too — as long as it is a **means** not an **end** to her computer competence.

Activities for Groups

4) Identify tasks in your organization that might be computerized and attempt to "learn and do" by using already existing skills.

Resources

■ Identify members that have access to computers and word processors.

■ Identify members who have skills in organizational planning and in typing.

■ Establish tasks such as computerizing the membership list, putting the newsletter on a word processor, typing minutes on a word processor, creating a skills bank using database software.

Protecting Privacy

Activities for Individuals

1) Check the personal information about you which is stored in data banks. Check it for accuracy and, if necessary, get it corrected.

2) Check with the Credit Bureau in your city to see if you have a credit rating and what your file says about you. Your bank will be able to tell you how to do this.

3) Check school records for yourself and/or your children.

4) Write to the subscription department of your favourite magazines, and ask that your name not be given to other advertisers.

5) Write to your provincial member of parliament to make sure that computerization of health records ensures your privacy.

Activities for Groups

1) Discuss the potential problems concerning privacy with your group. Make a list of the areas that are of particular concern.

2) Try to find out if your concerns are being addressed as data banks are created. Your local consumer group might be helpful.

3) Express your group's concern with privacy by writing to those who make decisions about data banks holding medical records, tax returns, etc.

Taking Advantage of The New Technology

Activities for Individuals

1) If you can get access to a computer, use it to:

- Type your letters using word processing.
- Prepare an electronic spreadsheet to avoid recalculation of figures. Perhaps you can figure out how much food you need for a three-week canoe trip by entering the quantities of milk, flour, etc. for each recipe for each meal. Plan to do your taxes on computer this year.
- Start that book or article that you always said you were going to write. Use word processing so that you can delete and manipulate your work.

Activities for Groups

1) Use computers in your organizational work:

- Membership lists and renewals can be kept up to date; reminder notices can be typed automatically using database management programs.
- Mailing lists and labels can be generated from membership database and other sources.
- Newsletters, briefs, and reports can be drafted, edited and laid out more systematically using word processing software.
- Financial records can be kept using computers. Budgeting and cash flow forecasts can be done by using electronic spreadsheet software.
- Scheduling of volunteers can be computerized using purchased software or creating your own customized program.
- Communicate with other chapters using electronic mail if this is financially feasible.

Computer Education for Children

Activities for Individuals

1) Provide for a variety of experiences with computers and related activities.

Resources

- Purchase suitable learning software for your child to use on your own or a shared computer. Consider LOGO, an easy-to-program computer language which is appropriate for children six years and up.
- Purchase games for your child to use on a computer. Games demand eye-hand coordination and are a wonderful way to improve this skill.
- Contact your board of education or provincial ministry of education and find out where you can obtain free educational software.
- Enrol your child in a computer literacy course, or send them to a computer camp if possible.

Activities for Groups

1) Provide a variety of experiences with computers which the parents can share with their children.

Resources

- Have a local computer company demonstrate LOGO to your membership. Try to include hands-on experience.
- Have educators who are using LOGO or other computer applications in their classrooms speak to your group about their experiences.
- Provide a demonstration of computer games to your membership so that members can become more aware of the content of these games.
- Invite a speaker from your board of education or ministry of education to explain what is happening with regard to computerization in the schools.
- Express concern to educational organizations as to the content of educational software.
- Write private manufacturers of software about your concerns of excessive violence and sexism if applicable.

Activities for Individuals

2) Ensure that your child's school has added a computer component to the curriculum.

Resources

- Talk to your child's teacher or principal and find out what is or could be available to your child.
- Attend Parent Advisory Meetings to make sure that computers are being made available to all children. Make sure that the schools recognize that girls will be more hesitant to opt into computer use.
- Encourage teacher training for all the teachers in your child's school. It is important that your child sees all teachers feeling comfortable with computers.
- Lobby for more funds for computers in your school.
- Monitor how computers are being used in your school. Teachers are an important part of learning; the computer should be used as an adjunct to the learning experience.

Activities for Groups

2) Ensure that all children have an equal opportunity to use the computers in the schools.

Resources

- Visit a sampling of schools in your area. Look for problems such as computer clubs that only attract boys; computers being used only in enriched classes; computers only being used in classrooms in which the teacher is a male.
- Report findings to the Board of Education as a concerned community group.
- Suggest that your group become the beginnings of a computer advisory committee.

Ensuring the Health of All Workers

Activities for Individuals

1) Ensure that your individual health is not being endangered when using computers.

Resources

- Become sensitive to your own complaints of headache or eye-strain. Bring them to the attention of your supervisor and implement some preventive action if possible. Negotiate breaks and job sharing to protect your health.
- Ask for reassignment away from video display terminals if you have reason to believe that this work is harming you or your unborn child.
- Do physical exercises that are specially designed to help video display terminal users fight fatigue and boredom.

Activities for Groups

1) Ensure that you or co-workers are not endangering their health.

Resources

- Talk together to see if there are any patterns of headaches or eye-strain.
- Document sickness patterns that follow implementation of computers.

Activities for Individuals

2) Become involved in committees that influence working conditions. Your union should be active with you. If there is no union, find out about one that will help on these issues.

Resources

- Collect information on health problems that may be connected to computer usage by talking to co-workers and reading. Find out if input strokes are being used to monitor workers.
- Influence your union to be concerned about health and safety issues and in particular, eye and back strain and stress due to monitoring, which have been associated with computer usage.
- Support protective legislation where it exists and seems useful. Lobby for better coverage.

Activities for Groups

2) Become concerned with the quality of work life since the advent of computers.

Resources

- Write a brief documenting your concerns about the health hazards of computers. Get the support of your union membership and executive.
- Send this brief to government agencies, management and the media, your MP, and MLA.
- Support legislation limiting monitoring and controls that employers can impose on employees through computers.

Appendices

Do You Need One Now?

How can YOU make use of a personal computer?

1. Would you like to learn about computers by using one?
2. Do you want to use it to teach your pre-schooler?
3. Do you want to use the computer as a learning vehicle for yourself or your child?
4. Do you want to use a computer to create written documents such as letters, reports, and newsletters?
5. Do you want to keep track of financial records more complicated than your cheque-book. . . for example, investments or small business accounts?
6. Do you want to keep track of a special collection (photos, slides, coins, etc.) or organize large amounts of information?
7. Is your budget (or cash flow budget) always being revised, causing repeated recalculations?
8. Do you want access to all kinds of information. . . particularly financial information (stock prices) or bibliographic information?
9. Do you want to send written documents or messages through the telephone wires?
10. If it were possible, would you like to do your banking and shopping from your home?
11. Do you want to indulge your creative musical and/or artistic abilities? Does your business need graphics in reports?
12. Would you like to be able to do research on a specific news event without having to personally read every paper?

Interpreting Your Answers

Question 1. — Any computer with self instruction or any hands-on computer course will be a start. Many books are also available, but hands-on experience is a must.

Question 2. — There are some software packages to choose from which allow very young children to enjoy using the computer.

Games can be useful for developing manual dexterity, differentiating right from left, and so on.

Question 3. — Many ministries and boards of education have developed educational software packages which are available to the public. Educational software packages are also available for purchase through computer outlets, but they are costly and the quality varies. You and your child's teacher might consult about what is available and what might be useful.

Questions 4 and 9. — You will need a word processing system. A useful one requires a 64K memory size (approximately 64,000 bytes of memory). Programs to check your spelling and grammar are also available. For communicating with other computers via the telephone lines, you will need a modem.

Question 6. — Database management software will allow you to store your information on a disk, and then retrieve specific data on command.

Questions 5 and 7. — Special financial and business record-keeping programs are available but you must pay attention to the size of the memory of your computer. Not all computers have large enough memories to keep complicated accounts. The general ledger program is the most demanding for the user. A general purpose "electronic spreadsheet" is the most versatile. There are many similar packages which exist under different names.

Questions 8, 10, and 12. — Information, from a variety of suppliers and sources, can be brought into the home through personal computers. A modem and some software, in addition to a personal computer, are needed to access these suppliers. There are free information services, such as some provincial tourist bureaus, whose purpose is mainly to advertise. These information services may have a hook-up fee and charge for the time you are accessing their data. Electronic bulletin boards focusing on specific areas of interest allow users to "post" messages to other subscribers and receive responses. Imagine the power of a North American Women's Bulletin Board and its implications for communication and action.

Question 11. — Surprisingly sophisticated graphics programming and music capabilities are available on some microcomputers.

If You're Thinking of Buying a Computer

If you decide that you want to buy a computer, you need to decide what size you want, what extra pieces of equipment you require desire, and what software you need.

1. Visit two or three stores where computers are sold (including department stores, specialty computer stores) and. . .
   - Ask: "What can a personal computer do for me?"
   - Ask to see a "small system".
   - Ask to see a "medium-size system".
   - Ask to see a portable system.
   - Finally, ask to see a well-known standard-sized microcomputer system.
   - Concentrate at this stage on finding out what **kinds** of things they do.

2. Go home and think about how you (and or your family) could use a personal computer for business or personal matters. Step 1 should have stimulated your imagination. Write down everything that you think of in as much detail as you can. Use the "Do You Need One Now?" section on pages 91-92. Take a course if possible.

3. Return to the same stores or three new stores and show the salesperson your list from Step 2. Each time, talk with the salesperson about the computer that will do the best job for you. Ask for a specific quote for all the hardware and software that you will need for your list of uses. Don't accept vague answers — the quote should be in writing.

4. In each store in Step 3 you will probably be guided to a medium- or regular-sized system. Ask to have a less expensive system explained to you, and ask all of the questions you just asked all over again. Write down the answers.

5. Return home for another think session. Consider the quotes that you have received, the uses that you will be making of the computer, and your budget (including any income you might be generating with your computer).

6. Then call a half dozen stores (long distance, if necessary) and ask what is available in your price range to do what you want

to do. At the small-, medium- and portable-sized systems levels, you can probably make the choice by yourself. At the regular-sized system level, you have such a wide choice that you either have to spend more time gaining knowledge or find a more experienced person who is not a salesperson to guide you.

Glossary

ASCII (pronounced "askey"): A standard code which assigns a specific code number to each letter, number, or punctuation mark. The code number is composed of 1s and 0s; for example, the letter "A" is coded as "01000001". The coding number is based on the binary system. ASCII stands for American Standard Code for Information Interchange.

BASIC: One of many languages used in computers. It is used to write step-by-step instructions that will instruct the computer to do a specific task. BASIC is the most popular language for beginners. BASIC stands for Beginner's All-Purpose Symbolic Instructions Code.

BAUD: The speed (bits per second) that information is transmitted to and/or from a computer. Transmission might be to a printer or to another computer via the telephone line.

BIT: The term bit is constructed from the word BInary digiT and refers to a single digit of a binary number, a "1" or a "0". A bit is the smallest unit of data with which a computer can work.

BOOT: "To boot" — in some computers you must use a special program (in disk form) in order for the computer to be able to "talk" to its disk drives so that any further information or program can be placed in the computer. Doing so results in the computer being ready to do a specific task.

BUG: Any error or malfunction in a program that causes incorrect results.

BYTE: A group of eight binary digits or bits. Information is organized in the computer in terms of bytes. Computer memory is measured by the number of bytes which can be stored in its memory.

CENTRAL PROCESSING UNIT (CPU): The CPU is sometimes called the nerve centre of any computer system since it coordinates and controls the activities of all the other units. The CPU consists of three main sections: memory, arithmetic-logic unit, and control unit.

CHIP: Small personal computers became a possibility because of the invention of the chip. A chip is layers of silicon in which circuitry is embedded. It is called an integrated circuit because it can send, receive, and store impulses on one chip.

COMPUTER: A device that can accept information and then follow instructions developed to process or manipulate that information.

CP/M: Every computer has an operating system which allows the computer to do certain "housekeeping" chores like accessing data to and from disks, or making copies of disks, or deleting a file. The most common operating system for eight-bit computers is CP/M (CONTROL PROGRAM for MICROPROCESSORS).

CRASH: When the computer is not capable of controlling the flow of information in an orderly manner and the data cannot move through the computer properly, all computer operations stop. When the computer crashes, commands from the keyboard no longer have any effect. The only way to re-establish control is to turn off the computer and restart the program.

CATHODE RAY TUBE (CRT): The screen, similar to a television screen, which displays input and output. It is also called a MONITOR, or a VIDEO DISPLAY TERMINAL (VDT).

CURSOR: A square or line displayed on the monitor that shows where the next typed character will be displayed. It is a pointing device that can be controlled by the user.

DATA: In the broadest sense, data refers to information in the form of numbers, letters or symbols, which is handled by the computer. Strictly speaking, data is that information which is acted upon and transformed by the computer program (for instance, names in a mailing list, the text put into a word processor, etc.).

DISK OR DISKETTE OR FLOPPY DISK: A flat circle of plastic material, coated with the same magnetic substance used on tapes for tape recorders, which is used to store information. Disks are used to store data or programs. Most disks for personal computers are 5¼ inches in diameter and can store about 30 to 40 typewritten pages. Each disk is enclosed in a square protective envelope.

DISK DRIVE: A mechanical device in which disks are inserted for read (input) and write (output) operations.

ELECTRONIC MAIL: The transmission of numerical and written messages from one computer to another. As an example, inter-office memos could be sent via the computer using electronic mail if all persons involved had access to a computer. As well, an individual or group could belong to a network of other computer users who exchange information of any sort among each other.

HARDCOPY: A printed copy of information from a computer. Hardcopy is on paper and is sometimes called a PRINTOUT.

HARDWARE: The physical components of a computer system, including all electronic and electromechanical devices and connections.

HIGH TECH OR HI TECH: A general term that refers to any technology based on silicon micro chips.

INPUT/OUTPUT DEVICES (I/O): A general term referring to the devices that either bring in or put out information from the computer. A disk drive or a cassette tape recorder are I/O devices.

INPUT INFORMATION: Data or programs that are entered into a computer for processing or storage.

JOYSTICK: A device that places a cursor anywhere on a screen (up, down, right, left). A joystick can be used as an input device for computer games.

K OR KILOBYTES: In microcomputer usage, K means 1024 bytes of information. 16 K is approximately 16,000 bytes.

MODEM: An electronic device which is used to transmit data via the telephone lines. It converts (or modulates) the computer's digital pulses to the type of electronic signal that can be transmitted over telephone lines. At the receiving end, another modem re-converts the signal into the form the computer can read. This is a two-way process. Modems therefore allow computers to "talk" to each other. The word MODEM comes from MOdulator-DEModulator.

OPERATING SYSTEM: A program used by the computer for "housekeeping" chores, such as making a copy of a disk, or deleting a file. CP/M (Control Program for Microprocessors) and MS-DOS (Micro Soft Disk Operating System) are examples of operating systems.

PERIPHERAL DEVICES: Any device that is attached to the computer and is under the computer's control. Printers, disk drives, and cassette tape recorders are all examples of peripheral devices.

PCB: The rectangular, usually green, piece of hardware which can be found inside the computer. The chips and circuits are mounted on this board. PCB means Printed Circuit Board.

PACKAGES: Application software which is pre-packaged for various consumer uses. A word processing package is one example.

PROGRAM: A set of instructions arranged in proper sequence which directs the computer to perform a desired operation, such as putting a list of names into alphabetical order.

RANDOM ACCESS MEMORY (RAM): The part of the computer's memory that is for temporary storage of data and programs. When the computer is turned off, all data that has been stored in the RAM is cleared. Data in the RAM is usually stored on a disk or tape before turning the machine off to prevent the loss of data and programs.

READ ONLY MEMORY (ROM): An internal computer memory that contains permanent programs or directions to the computer. The contents of the ROM memory are rarely changed and are a permanent part of the computer. Turning off the computer does not erase the ROM memory.

SOFTWARE: The step-by-step procedures for the computer. Software can be a program for a specific application, a language such as BASIC, or a disk operating system.

USER-FRIENDLY: Hardware or software that is easy to use by the computer user.

VIDEO DISPLAY TERMINAL (VDT): The screen which displays information from the computer is called a VIDEO DISPLAY TERMINAL, a CATHODE RAY TUBE, or a MONITOR. A VDT is used to display input and output.

Notes

Chapter II

1. Portions of this chapter were contributed by Joe Cooper and Nancy Corbett.

Chapter III

1. Heather Menzies, **Computers on the Job: Surviving Canada's Microcomputer Revolution.** (Toronto: James Lorimer, 1982).

   ———. **Women and the Chip: Case Studies of the Effects of Informatics on Employment in Canada.** (Montreal: Institute for Research on Public Policy, 1981).

2. For a useful book on these issues, see: Heather Menzies, **Women and The Chip** (Montreal: Institute for Research on Public Policy, 1981). A related article is: Douglas Yonson, "The limits to high tech job creation", **Financial Post** (March 28, 1983), pp. 4-6.

3. See: Seymour Papert, **Mindstorms: Children, Computers, and Powerful Ideas** (New York: Basic Books, 1980).

4. Sheila Tobias, **Overcoming Math Anxiety** (New York: W.W. Norton and Company, 1978).

5. For a discussion of constraints on the participation of young girls and women in math and sciences, see: Science Council of Canada, **Who Turns the Wheel?** Proceedings of a workshop on the Science Education of Women in Canada (Ottawa: Minister of Supply and Services, 1981).

6. For further discussion of these related health issues for women and men, see: Nancy Miller Chenier, **Reproductive Hazards at Work: Men, Women and the Fertility Gamble** (Ottawa: Canadian Advisory Council on the Status of Women, 1982).

7. For a graphic discussion of the content of video games, see: Duncan Mackenzie, "Video Games", **Homemaker's Magazine** (July/August 1984), pp. 48-58.

8. **(The) Facts,** Canadian Union of Public Employees, vol. 5, no. 7 (September 1983), p. 75.

9. **Ibid.**

10. For a discussion of international commitments to the development of microtechnology for military use, see: Peter Marsh, **The Silicon Chip Book** (London: Abacus Sphere Books, 1981), Chapter 9.

    For a brief discussion of these issues in the Canadian context, see: Marc Bélanger, "Silicon Society", **(The) Facts,** Canadian Union of Public Employees, vol. 5, no. 7 (September 1983), pp. 60-61.

Information Resources

Magazines

It may be best to go to the following "magazine of magazines" for a first look, because of the vast, constantly changing number of magazines and their varied content, format, and goals. Its size and cost make it a reference book that should be found in your public library.

Wallace, W.H. **What's In Print: The Subject Guide to Computing Magazines.** Blue Ridge Summit, Pa.: Tab Books, 1984.

Audio Visual

The series of television programs called "Bits and Bytes", produced by TVOntario, is an extremely popular primer on computers, their uses, and how to use them. They are available to educational organizations and institutions, on videotape from TVOntario. There are accompanying printed educational materials.

Bits and Bytes,
TVOntario
Customer Service
Box 200, Station "Q",
TORONTO, Ontario
M4T 2T1

Bits and Bytes Resource Book
(same address as above)

The Computer Academy: An Anthology of Articles, based on "Bits and Bytes"
Addresses, essays and lectures,
The Computer Academy
TVOntario
Customer Service
(same address as above)

There is a French-language equivalent of Bits and Bytes — two series of 12 hour-long programs, called "Octo-puce" and "Octo-puce Plus". For information write to:

Ministère de l'Éducation du Québec
Direction des cours par correspondance
4e étage
600, rue Fullum
MONTRÉAL (Québec)
H2K 4L1

Other Audio Visual

"Good Monday Morning", Skyworks Productions. This 30-minute film concerns women who work in offices where microtechnology is having a significant impact. Available from Skyworks, 655 Palmerston Ave., Toronto, Ontario.

"Now The Chips are Down", BBC Production. This film shows how microprocessors are made, explores why they were invented, their current uses, and implications for the future. Available from BBC Enterprises Film Sales, Manulife Centre, 55 Bloor St.W., Suite 1220, Toronto, Ontario or from Canadian Labour Congress, Labour Studies and Education Centre, 2841 Riverside Dr., Ottawa, Ontario K1V 2E1.

Books

The computer book market is also growing explosively, so it might be good to start with an overview such as the first book listed below:

Poneroe, Chris. **Book Bytes: A Guide to 1200 Micro Computer Books.** New York: Pantheon Books, 1984.

Other Books

Belbahri, Nadir. **Introduction à l'informatique.** Montreal: Inforum, 1980.

Bluestone, Barry. **The Deindustrialization of America: Plant Closings, Community Abandonment, and the Dismantling of Basic Industry.** New York: Basic Books, 1982.

Brown, Carol W. **The Minicomputer Simplified: An Executive's Guide to the Basics.** New York: The Free Press, 1984.

Camuse, Ruth. **Parent and Child Computer.** Reston, Virginia: Refton Publishing Co., 1984.

Canada. Labour Canada. Task Force on Micro-Electronics and Employment. **In the Chips: Opportunities, People, Partnerships.** Ottawa: Labour Canada, 1982.

Canada. Labour Canada. Women's Bureau. **Proceedings of a Conference on the Impact of Micro-Electronics Technology on the Work Environment.** Ottawa, March 29-31, 1981. Ottawa: Supply and Services Canada, 1981.

Canadian Advisory Council on the Status of Women (CACSW). **Microtechnology and Employment: Issues of Concern to Women.** Ottawa: CACSW, 1982.

Corbett, Scott. **Home Computers, A Simplified and Informative Guide.** Toronto: Little, Brown & Co., 1980.

Dictionnaire de l'informatique. Paris: Larousse, 1972.

(The) Facts. "The New Electronic Canada", vol. 5, no. 7 (September 1983), published by Canadian Union of Public Employees (CUPE), 21 Florence St., Ottawa, Ontario K2P 0P2.

Holtman, Charles P. **What to Do When You Get Your Hands on a Microcomputer.** Blue Ridge Summit, Pa: Tab Books, 1982.

Huws, Ursula. **Your Job in the Eighties: a Woman's Guide to New Technology.** London: Pluto Press, 1982.

Kidder, Tracy. **The Soul of a New Machine.** New York: Avon, 1982.

Kushan, Barbara and Nancy Healy. **Computer Fun-Damentals.** Reston, Virginia: Refton Publishing Co., 1984.

Lethuillier, Jacques. **Informatique: avec lexique anglais-français et français-anglais.** Montreal: Sodilis, 1982.

Loop, Liza, Julie Anton, and Ramon Zamora. **ComputerTown: Bringing Computer Literacy to your Community.** Reston, Virginia: Refton Publishing Co., 1983.

Menzies, Heather. **Computers on the Job: Surviving Canada's Microcomputer Revolution.** Toronto: James Lorimer, 1982.

_____. **Women and the Chip: Case Studies of the Effects of Informatics on Employment in Canada.** Montreal: Institute for Research on Public Policy, 1981.

Micro-technology, published by National Union of Provincial Government Employees (NUPGE), 204-2841 Riverside Dr., Ottawa, Ontario K1V 2E1.

Miller Chenier, Nancy. **Reproductive Hazards at Work: Men, Women and the Fertility Gamble.** Ottawa: Canadian Advisory Council on the Status of Women, 1982.

Naisbitt, John. **Megatrends: Ten New Directions Transforming Our Lives.** New York: Warner Paperback, 1984.

Osborne, Adam. **Running Wild: The Next Industrial Revolution.** Berkeley, Ca: Osborne McGraw Hill, 1979.

Papert, Seymour. **Mindstorms: Children, Computers, and Powerful Ideas.** New York: Basic Books Inc., 1980.

Parker, Robert G., Deloitte Haskins & Sells. **1984 Canadian Business Guide to Microcomputers.** Scarborough: Prentice-Hall Canada Inc., 1984.

Peitchinis, Stephen G. **Microelectronic Technology and Female Employment.** Presentation to the Colloquium on the Economic Status of Women in the Labour Market, for the Economic Council of Canada, November 26-28, 1984, Montreal.

Peterson, Dale, ed. **Intelligent Schoolhouse: Readings on Computers and Learning.** Reston, Virginia: Refton Publishing Co., 1984.

Ralston, Anthony, ed. **Encyclopedia of Computer Science and Engineering,** 2nd ed. New York: Van Nostrand Reinhold Company, 1983.

Science Council of Canada. **The Impact of the Micro-Electronics Revolution on Work and Working.** Proceedings of a workshop sponsored by the Science Council of Canada, 1980, Committee on Computers and Communications, Ottawa.

Science Council of Canada. **Planning Now for an Information Society: Tomorrow is too Late!** Ottawa: Supply and Services Canada, 1982.

Scientific American. "The Mechanization of Work", vol. 247, no. 3 (September 1982).

Scientific American, vol. 237, no. 3 (September 1977).

Shalls, Michael. **The Silicon Idol: The Microcomputer and Its Social Impact.** New York: Oxford University Press, 1984.

Tobias, Sheila. **Overcoming Math Anxiety.** New York: W.W. Norton & Co., Inc., 1978.

Toffler, Alvin. **The Third Wave.** New York: Morrow, 1980.

Webster, Tony, ed. **Micro Computer Buyers' Guide: 1984.** New York: McGraw Hill, 1984.

Weinburg, Sanford B., Ph.D., and Mark Lawrence Furere. **Computer Phobia: How to Slay the Dragon of Computer Fear.** Wayne, N.J.: Banbury, 1984.

Weizenbaum, Joseph. **Computer Power and Human Reason: From Judgement to Calculation.** New York: Penguin, 1985.

Williams, Brian, and Richard Tingey. **The Urgently Needed Parent's Guide to the Computer.** Don Mills, Ont: Addison-Wesley, 1983.

The Canadian Advisory Council on the Status of Women was established as an independent advisory body in 1973 in response to a recommendation by the Royal Commission on the Status of Women. Its mandate, "to bring before the government and the public matters of interest and concern to women" and "to advise the Minister on such matters relating to the status of women as the Minister may refer to the Council for its consideration or as the Council may deem appropriate", is wide and may be interpreted to cover all Council activities on behalf of Canadian women.

The Council is an autonomous agency that reports to Parliament through the Minister Responsible for the Status of Women. This allows the Council to maintain a voice within Parliament and at the same time maintain the right to publish without ministerial consent.

The following were members of the Canadian Advisory Council on the Status of Women at the time of publication (1985):

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Acting President
Ottawa, Ontario

Eileen Hendry
First Vice-President
Vancouver, B.C.

Marie-Hélène Boyle
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